

[D08-243](#)

## McDonald's

### 15210 Tukwila International Boulevard

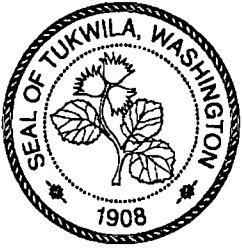
Due to the file size, this record has been broken down into 4 segments for easier download. Click on the following links to review the permit segments:

- [Segment 1](#) - McDonald's D08-243
- [Segment 2](#) - McDonald's D08-243
- [Segment 3](#) - McDonald's D08-243
- [Segment 4](#) - Plans - McDonald's D08-243

**MCDONALDS RESTAURANT**

**15210 TUKWILA  
INTERNATIONAL BL**

**D08-243**



# City of Tukwila

## Department of Community Development

6300 Southcenter Boulevard, Suite #100  
Tukwila, Washington 98188  
Phone: 206-431-3670  
Fax: 206-431-3665  
Web site: <http://www.ci.tukwila.wa.us>

## CERTIFICATE OF OCCUPANCY

This certificate is issued pursuant to the requirements of Section 110.2 of the 2006 edition of the International Building Code. At the time of issuance, this structure or portion thereof has been inspected for compliance with the requirements of this code for the occupancy and division of occupancy and the use for which the proposed occupancy is classified.

**Building Permit No.:** D08-243

**Occupant/Tenant:** MCDONALD'S RESTAURANT

**Building Address:** 15210 TUKWILA INTERNATIONAL BL, SUITE NO.

**Parcel No.:** 0043000096

**Property Owner:** COMISKEY ROBERT  
C/O MCDONALD'S, 18161 NORMANDY TER SW 98166

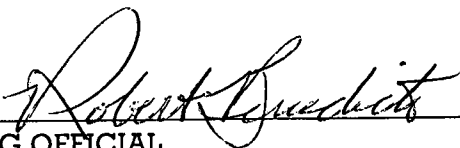
**Use:** RESTAURANT


**Occupancy Group/Division:** A2

**Type of Construction:** VB

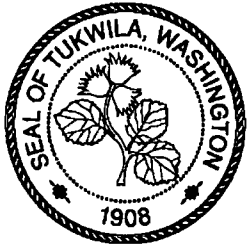
**Automatic Sprinkler System:** Provided: Y  
Required: Y

**Design Occupant Load:** 150

  
BUILDING OFFICIAL

  
DATE

**THIS CERTIFICATE TO BE CONSPICUOUSLY POSTED ON THE PREMISES**



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### DEVELOPMENT PERMIT

Parcel No.: 0043000096  
Address: 15210 TUKWILA INTERNATIONAL BL TUKW  
Suite No:

Permit Number: **D08-243**  
Issue Date: **08/25/2008**  
Permit Expires On: **02/21/2009**

**Tenant:**

Name: **MCDONALD'S RESTAURANT**  
Address: 15210 TUKWILA INTERNATIONAL BL , TUKWILA WA

**Owner:**

Name: **COMISKEY ROBERT**  
Address: C/O MCDONALD'S , 18161 NORMANDY TER SW 98166  
Phone:

**Contact Person:**

Name: **DOUG BATES**  
Address: 12131 113 AV NE, STE 103 , KIRKLAND WA 98034  
Phone: 425 242-2411

**Contractor:**

Name: **SPECTRUM ENTERPRISES LLC**  
Address: 9810 48TH AVE EAST , TACOMA, WA 98446  
Phone: 253 539-4766  
Contractor License No:

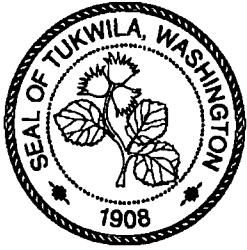
Expiration Date:

**DESCRIPTION OF WORK:**

CONSTRUCTION OF NEW 5483 SF RESTAURANT. PROJECT ON VALLEY VIEW SEWER AND WD #125 WATER.  
Public Works activities include: FRONTAL IMPROVEMENTS ALONG S 152nd ST (CURB CUT/ACCESS/SDWK, ONE STREET LIGH), STREET USE, LAND ALTERING, EROSION CONTROL, STORM DRAINAGE, GREASE INTERCEPTOR, DDCVA/FIRE VAULT, POSSIBLE RIGHT OF WAY RESTORATION.

|                          |              |                                      |             |
|--------------------------|--------------|--------------------------------------|-------------|
| Value of Construction:   | \$801,066.30 | Fees Collected:                      | \$30,163.55 |
| Type of Fire Protection: | SPRINKLERS   | International Building Code Edition: | 2006        |
| Type of Construction:    | VB           | Occupancy per IBC:                   | 4           |

\*\*continued on next page\*\*



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Permit Number: **D08-243**  
Issue Date: **08/25/2008**  
Permit Expires On: **02/21/2009**

### Public Works Activities:

|                                     |   |                        |                  |
|-------------------------------------|---|------------------------|------------------|
| Channelization / Striping:          | N |                        |                  |
| Curb Cut / Access / Sidewalk / CSS: | Y |                        |                  |
| Fire Loop Hydrant:                  | Y | Number: 0              | Size (Inches): 0 |
| Flood Control Zone:                 |   |                        |                  |
| Hauling:                            | N | Start Time:            | End Time:        |
| Land Altering:                      | Y | Volumes: Cut 2500 c.y. | Fill 2100 c.y.   |
| Landscape Irrigation:               |   |                        |                  |
| Moving Oversize Load:               |   | Start Time:            | End Time:        |
| Sanitary Side Sewer:                |   |                        |                  |
| Sewer Main Extension:               |   | Private:               | Public:          |
| Storm Drainage:                     | Y |                        |                  |
| Street Use:                         | Y | Profit: N              | Non-Profit: N    |
| Water Main Extension:               |   | Private:               | Public:          |
| Water Meter:                        | N |                        |                  |

Permit Center Authorized Signature: Marshall Date: 08/25/08

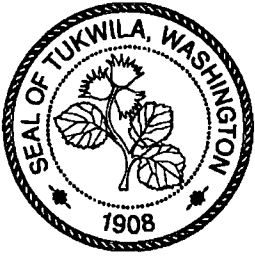
I hereby certify that I have read and examined this permit and know the same to be true and correct. All provisions of law and ordinances governing this work will be complied with, whether specified herein or not.

The granting of this permit does not presume to give authority to violate or cancel the provisions of any other state or local laws regulating construction or the performance of work. I am authorized to sign and obtain this development permit.

Signature: Doug Bates Date: 8/25/08

Print Name: DOUG BATES

This permit shall become null and void if the work is not commenced within 180 days from the date of issuance, or if the work is suspended or abandoned for a period of 180 days from the last inspection.



# City of Tukwila

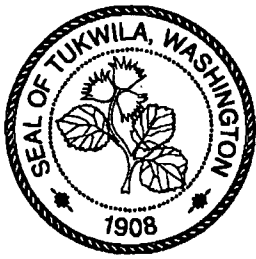
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### PERMIT CONDITIONS

|             |                                     |                |                   |
|-------------|-------------------------------------|----------------|-------------------|
| Parcel No.: | 0043000096                          | Permit Number: | <b>D08-243</b>    |
| Address:    | 15210 TUKWILA INTERNATIONAL BL TUKW | Status:        | <b>ISSUED</b>     |
| Suite No:   |                                     | Applied Date:  | <b>04/30/2008</b> |
| Tenant:     | <b>MCDONALD'S RESTAURANT</b>        | Issue Date:    | <b>08/25/2008</b> |

- 1:
- 2: **\*\*\*BUILDING DEPARTMENT CONDITIONS\*\*\***
- 3: No changes shall be made to the approved plans unless approved by the design professional in responsible charge and the Building Official.
- 4: All mechanical work shall be inspected and approved under a separate permit issued by the City of Tukwila Permit Center (206/431-3670).
- 5: All permits, inspection records, and approved plans shall be at the job site and available to the inspectors prior to start of any construction. These documents shall be maintained and made available until final inspection approval is granted.
- 6: The special inspections and verifications for concrete construction shall be required.
- 7: The special inspections for steel elements of buildings and structures shall be required. All welding shall be done by a Washington Association of Building Official Certified welder.
- 8: Installation of high-strength bolts shall be periodically inspected in accordance with AISC specifications.
- 9: The special inspection of bolts to be installed in concrete prior to and during placement of concrete.
- 10: When special inspection is required, either the owner or the registered design professional in responsible charge, shall employ a special inspection agency and notify the Building Official of the appointment prior to the first building inspection. The special inspector shall furnish inspection reports to the Building Official in a timely manner.
- 11: A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted to the Building Official. The final inspection report shall be prepared by the approved special inspection agency and shall be submitted to the Building Official prior to and as a condition of final inspection approval.
- 12: New suspended ceiling grid and light fixture installations shall meet the non-building structures seismic design requirements of ASCE 7.
- 13: Partition walls that are tied to the ceiling and all partitions greater than 6 feet in height shall be laterally braced to the building structure.
- 14: Subgrade preparation including drainage, excavation, compaction, and fill requirements shall conform strictly with the recommendations given in the soils report. Special inspection is required.
- 15: All construction shall be done in conformance with the approved plans and the requirements of the International Building Code or International Residential Code, International Mechanical Code, Washington State Energy Code.
- 16: All food preparation establishments must have Seattle/King County Department of Public Health sign-off prior to opening or doing any food processing. Arrangements for final Health Department inspection shall be made by calling Seattle/King



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County Department of Public Health, (206/296-4928), at least three working days prior to desired inspection date. On work requiring Health Department approval, it is the contractor's responsibility to have a set of plans approved by the agency on the job site.

17: Notify the City of Tukwila Building Division prior to placing any concrete. This procedure is in addition to any requirements for special inspection.

18: All wood to remain in placed concrete shall be treated wood.

19: Masonry construction shall be special inspected.

20: There shall be no occupancy of a building until final inspection has been completed and approved by Tukwila building inspector. No exception.

21: Manufacturers installation instructions shall be available on the job site at the time of inspection.

22: A Certificate of Occupancy shall be issued for this building upon final inspection approval by Tukwila building inspector.

23: All plumbing and gas piping work shall be inspected and approved under a separate permit issued by the City of Tukwila Permit Center.

24: All electrical work shall be inspected and approved under a separate permit issued by the City of Tukwila Building Department (206-431-3670).

25: **VALIDITY OF PERMIT:** The issuance or granting of a permit shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of the building code or of any other ordinances of the City of Tukwila. Permits presuming to give authority to violate or cancel the provisions of the code or other ordinances of the City of Tukwila shall not be valid. The issuance of a permit based on construction documents and other data shall not prevent the Building Official from requiring the correction of errors in the construction documents and other data.

26: **\*\*\*FIRE DEPARTMENT CONDITIONS\*\*\***

27: The attached set of building plans have been reviewed by the Fire Prevention Bureau and are acceptable with the following concerns:

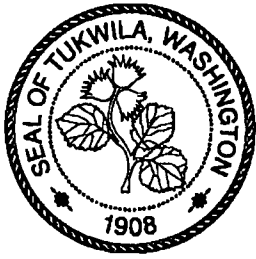
28: Provide minimum 20 ft. inside turning radiuses at entrances from street.

29: The total number of fire extinguishers required for an ordinary hazard occupancy with Class A fire hazards is calculated at one extinguisher for each 1,500 sq. ft. of area. The extinguisher(s) should be of the "All Purpose" (2A, 20B:C) dry chemical type. Travel distance to any fire extinguisher must be 75' or less. (IFC 906.3) (NFPA 10, 3-2.1)

30: Portable fire extinguishers, not housed in cabinets, shall be installed on the hangers or brackets supplied. Hangers or brackets shall be securely anchored to the mounting surface in accordance with the manufacturer's installation instructions. Portable fire extinguishers having a gross weight not exceeding 40 pounds (18 kg) shall be installed so that its top is not more than 5 feet (1524 mm) above the floor. Hand-held portable fire extinguishers having a gross weight exceeding 40 pounds (18 kg) shall be installed so that its top is not more than 3.5 feet (1067 mm) above the floor. The clearance between the floor and the bottom of the installed hand-held extinguishers shall not be less than 4 inches (102 mm). (IFC 906.7 and IFC 906.9)

31: Fire extinguishers shall not be obstructed or obscured from view. In rooms or areas in which visual obstruction cannot be completely avoided, means shall be provided to indicate the locations of the extinguishers. (IFC 906.6)

32: Extinguishers shall be located in conspicuous locations where they will be readily accessible and immediately available for use. These locations shall be along normal paths of travel, unless the fire code official determines that the



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hazard posed indicates the need for placement away from normal paths of travel. (IFC 906.5)

33: Portable fire extinguishers shall be provided within a 30-foot (9144 mm) travel distance of commercial-type cooking equipment. Cooking equipment involving vegetable or animal oils and fats shall be protected by a Class K rated portable extinguisher. (IFC 904.11.5)

34: A Type 1 hood shall be installed at or above all commercial cooking appliances and domestic cooking appliances used for commercial purposes that produce grease vapors. Each required commercial kitchen exhaust hood and duct system required by section 610 of the International Fire Code to have a Type 1 hood shall be protected with an approved automatic fire-extinguishing system installed in accordance with this code. (IFC 610.2, IFC 904.2.1 and IFC 904.11) Automatic fire-extinguishing systems shall comply with UL 300 or other equivalent standards and shall be installed in accordance with the requirements of the listing. (NFPA 96, 10.2.3)

35: All new automatic fire-extinguishing systems and all modifications to existing automatic fire-extinguishing systems shall have fire department review and approval of drawings prior to installation or modification.

36: Type I hood systems shall be designed and installed to automatically activate the exhaust fan whenever cooking operations occur. The activation of the exhaust fan shall occur through an interlock with the cooking appliances, by means of heat sensors or by means of other approved methods. (IMC 507.2.1.1)

37: Egress doors shall be readily openable from the egress side without the use of a key or special knowledge or effort. (IFC 1008.1.8.3 subsection 2.2)

38: Each door in a means of egress from an occupancy of Group A or E having an occupant load of 50 or more and any Group H occupancy shall not be provided with latch or lock unless it is panic hardware or fire exit panic hardware on rated fire doors. (IFC 1008.1.9)

39: Exits and exit access doors shall be marked by an approved exit sign readily visible from any direction of egress travel. Access to exits shall be marked by readily visible exit signs in cases where the exit or the path of egress travel is not immediately visible to the occupants. Exit sign placement shall be such that no point in an exit access corridor is more than 100 feet (30,480 mm) or the listed viewing distance for the sign, whichever is less, from the nearest visible exit sign. (IFC 1011.1)

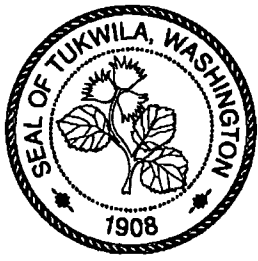
40: Every exit sign and directional exit sign shall have plainly legible letters not less than 6 inches (152 mm) high with the principal strokes of the letters not less than 0.75 inch (19.1 mm) wide. The word "EXIT" shall have letters having a width not less than 2 inches (51 mm) wide except the letter "I", and the minimum spacing between letters shall not be less than 0.375 inch (9.5 mm). Signs larger than the minimum established in section 1011.5.1 of the International Fire Code shall have letter widths, strokes and spacing in proportion to their height. The word "EXIT" shall be in high contrast with the background and shall be clearly discernible when the exit sign illumination means is or is not energized. If an arrow is provided as part of the exit sign, the construction shall be such that the arrow direction cannot be readily changed. (IFC 1011.5.1)

41: Exit signs shall be illuminated at all times. To ensure continued illumination for a duration of not less than 90 minutes in case of primary power loss, the sign illumination means shall be connected to an emergency power system provided from storage batteries, unit equipment or on-site generator. (IFC 1006.1, 1006.2, 1006.3)

42: Means of egress, including the exit discharge, shall be illuminated at all times the building space served by the means of egress is occupied. The means of egress illumination level shall not be less than 1 foot-candle (11 lux) at the floor level. The power supply for the means of egress illumination shall normally be provided by the premise's electrical supply. In event of a power failure an emergency power system shall provide power for a duration of not less than 90 minutes and shall consist of storage batteries, unit equipment or on-site generator. (IFC 1006.1, 1006.2, 1006.3)

43: Aisles leading to required exits shall be provided from all portions of the building and the required width of the aisles shall be unobstructed. (IFC 1013.4)



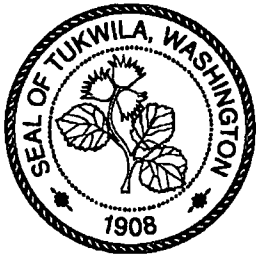


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- 44: Exit hardware and marking shall meet the requirements of the International Fire Code. (IFC Chapter 10)
- 45: Every room or space that is an assembly occupancy shall have the occupancy load of the room or space posted in a conspicuous place, near the main exit or exit access doorway from the room or space. Posted signs shall be of an approved legible permanent design and shall be maintained by the owner or authorized agent. (IFC 1004.3)
- 46: An approved automatic fire sprinkler extinguishing system is required for this project. (City Ordinance #2050)
- 47: U.L. central station supervision is required. (City Ordinance #2050)
- 48: Maintain sprinkler coverage per N.F.P.A. 13. Addition/relocation of walls, closets or partitions may require relocating and/or adding sprinkler heads. (IFC 901.4)
- 49: Sprinklers shall be installed under fixed obstructions over 4 feet (1.2 m) wide such as ducts, decks, open grate flooring, cutting tables, shelves and overhead doors. (NFPA 13-8.6.5.3.3)
- 50: All new sprinkler systems and all modifications to existing sprinkler systems shall have fire department review and approval of drawings prior to installation or modification. New sprinkler systems and all modifications to sprinkler systems involving more than 50 heads shall have the written approval of the W.S.R.B., Factory Mutual, Industrial Risk Insurers Kemper or any other representative designated and/or recognized by the City of Tukwila, prior to submittal to the Tukwila Fire Prevention Bureau. No sprinkler work shall commence without approved drawings. (City Ordinance #2050)
- 51: Maintain a 4 foot clear space around the sprinkler riser(s) for emergency access. (NFPA 25) (City Ordinance #2050)
- 52: All valves controlling the water supply for automatic sprinkler systems and waterflow switches on all sprinkler systems shall be electrically supervised. (City Ordinance #2050)
- 53: All exterior components of sprinkler systems should be painted RED. This includes: Post indicator valves (PIV), outside stem and yoke (OSY), wall indicator valves (WIV), and Fire Department connection (FDC). (City Ordinance #2050)
- 54: Maintain minimum 40 degrees F. temperature in all areas to prevent sprinkler pipe from breaking and causing unnecessary damage. (NFPA 13-7.6.1.3.2, NFPA 25.5.2.5)
- 55: All control, drain, and test connection valves shall be provided with permanently marked weather-proof metal or rigid plastic identification signs. The signs shall be secured with corrosion-resistant wire, chain or other approved means. (NFPA 13-6.7.4.1, 6.7.4.2)
- 56: A supply of spare sprinklers (never fewer than 6) shall be maintained on the premises so that any sprinklers that have operated or been damaged in any way can be promptly replaced. These sprinklers shall correspond to the types and temperature ratings of the sprinklers in the property. The sprinklers shall be kept in a cabinet located where the temperature to which they are subjected will at no time exceed 100 degrees F. A special sprinkler wrench shall also be provided and kept in the cabinet to be used in the removal and installation of sprinklers. (NFPA 13-6.2.9.1, 6.2.9.2, 6.2.9.3, 6.2.9.6)
- 57: When the sprinkler riser is located inside a room, the door to the room shall have a sign with one-inch letters which reads "Sprinkler Riser". (NFPA 13)
- 58: The fire department connection (FDC) shall have a downward angle bend between 22.5 and 45 degrees, with a 5-inch Storz fitting(s) and Knox FDC locking Storz cap. (NFPA 13-6.8.3) (City Ordinance #2050)
- 59: The height of fire department connections (FDC's) shall be 36 to 48 inches above grade.
- 60: Fire department connections (FDC's) shall be oriented in the direction of fire apparatus access, have a 4 foot clear space in front and to the sides of the connection, be appropriately signed and protected from potential vehicular



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damage.

61: Fire department connections (FDC's) shall be located within 50 feet of a fire hydrant.

62: Hydrants shall not be closer than 4 feet to any fixed object (e.g., fences, parking, building, etc.), with the exception of hydrant guard posts. Guard posts shall be installed around hydrants not protected by curbs, so as to help prevent motor vehicles from contacting the hydrant. The guard posts shall be either steel pipe (minimum 4" diameter) filled with concrete or concrete (minimum 8" diameter). Posts shall be 3 feet from the center of the hydrant and shall not be in direct line with any discharge ports. Posts shall be 6 feet long; 3-3 1/2 feet shall be buried. Painted finish shall be the same color as for the applicable hydrants. The 4-foot circumference around the hydrant will be a level surface. (City Ordinance #2052)

63: Fire hydrants shall conform to American Water Works Association specifications C-502-54; it shall be compression type, equipped with two 2-1/2" N.S.T. hose ports and one 5" Storz pumper discharge port, and shall have a 1-1/4" Pentagon open-lift operating nut. (City Ordinance #2052)

64: All required hydrants and surface access roads shall be installed and made serviceable prior to and during the time of construction. (IFC 503.1, 508.1)

65: A fire alarm system is required for this project. The fire alarm system shall meet the requirements of N.F.P.A. 72 and City Ordinance #2051.

66: Maintain fire alarm system audible/visual notification. Addition/relocation of walls or partitions may require relocation and/or addition of audible/visual notification devices. (City Ordinance #2051)

67: All new fire alarm systems or modifications to existing systems shall have the written approval of The Tukwila Fire Prevention Bureau. No work shall commence until a fire department permit has been obtained. (City Ordinance #2051) (IFC 104.2)

68: An electrical permit from the City of Tukwila Building Department Permit Center (206-431-3670) is required for this project.

69: When the control panel is located inside a room, the door to the room shall have a sign with one-inch letters which reads "Fire Alarm" or "Fire Alarm Control". (City Ordinance #2051)

70: Fire Department lock boxes shall be provided for access to all fire alarm panels and sprinkler risers. The appropriate key(s) for access shall be placed in the lockbox. Lockbox order forms must be obtained from the Tukwila Fire Department. The lockbox should be mounted so that it is readily visible and not over 60 inches high. (City Ordinance #2051)

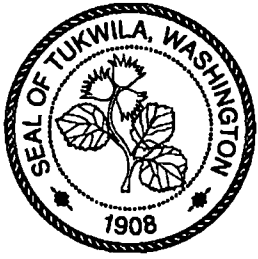
71: All electrical work and equipment shall conform strictly to the standards of the National Electrical Code. (NFPA 70)

72: The maximum flame spread class of finish materials used on interior walls and ceilings shall not exceed that set forth in Table No. 803.5 of the International Building Code.

73: In occupancies of Groups A, E, I and R-1 and dormitories in Group R-2, curtains, draperies, hangings and other decorative materials suspended from walls or ceilings shall be flame resistant in accordance with NFPA 701 or be noncombustible. Where required to be flame resistant, decorative materials shall be tested by an approved agency and pass Test 1, as described in NFPA 701, or such materials shall be noncombustible. Reports of test results shall be prepared in accordance with NFPA 701 and furnished to the fire code official upon request. (IFC 805.1, 805.2)

74: Utility and detention vaults, located in fire apparatus access roads, shall be designed to withstand an outrigger load of 45,000 lbs.

75: New and existing buildings shall have approved address numbers, building numbers or approved building identification



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placed in a position that is plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. Address numbers shall be Arabic numbers or alphabet letters. Numbers shall be a minimum of 4 inches (102mm) high with a minimum stroke width of 0.5 inch (12.7mm). (IFC 505.1)

76: This review limited to speculative tenant space only - special fire permits may be necessary depending on detailed description of intended use.

77: Contact The Tukwila Fire Prevention Bureau to witness all required inspections and tests. (City Ordinances #2050 and #2051)

78: To schedule all construction fire-related inspections send an e-mail to [fireinsprequest@ci.tukwila.wa.us](mailto:fireinsprequest@ci.tukwila.wa.us). Include your name, telephone number, permit number, project name and address and type of inspection requested.

79: Any overlooked hazardous condition and/or violation of the adopted Fire or Building Codes does not imply approval of such condition or violation.

80: These plans were reviewed by Inspector 511. If you have any questions, please call Tukwila Fire Prevention Bureau at (206)575-4407.

81: \*\*\*PUBLIC WORKS DEPARTMENT CONDITIONS\*\*\*

82: Minimum 48 hours in advance applicant and/or contractor shall call (206) 433-0179 and schedule a Public Works preconstruction meeting. Work shall be coordinated with City of SeaTac, Valley View Sewer District and Water District #125.

The contractor must notify the City Utility Inspector at (206)433-0179 upon commencement and completion of work at least 24 hours in advance. All inspection requests for utility work must also be made 24 hours in advance. Since more than one (1) acre of land will be disturbed as part of this development, applicant shall obtain a Construction NPDES permit from DOE.

83: Contractor shall notify Public Works Utility Inspector Mr. Greg Villanueva at (206)433-0179 of commencement and completion of work at least 24 hours in advance. Applicant shall sign an Authorization of Special Billing Form for after hours and/or weekend inspections and City Operations and Maintenance staff work.

84: Work affecting traffic flows shall be closely coordinated with the City Utilities Inspector. Traffic Control Plans shall be submitted to the Inspector for prior approval.

85: The City of Tukwila has an undergrounding ordinance requiring the power, telecommunications, and cable service lines be underground from the point of connection on the pole to the building.

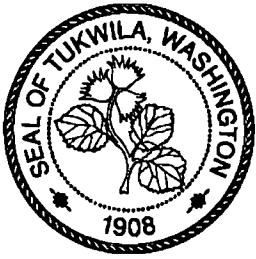
86: Permit is valid between the weekday hours of 7:00 a.m. and 3:30 p.m. only. Applicant shall execute Authorization of Special Billing form for any after hours and/or weekend inspection and Public Works maintenance staff work.

87: Flagging, signing and coning shall be in accordance with MUTCD for Traffic Control. Contractor shall provide certified flagmen for traffic control. Sweep or otherwise clean streets to the satisfaction of Public Works each night around hauling route (No flushing allowed) and work zone. Notify City Inspector before 12:00 Noon on Friday preceding any weekend work.

88: Any material spilled onto any street shall be cleaned up immediately.

89: Contractor performing work inside the City Right of Way shall have a valid Business License with the City of Tukwila.

90: Temporary erosion control measures shall be implemented as the first order of business to prevent sedimentation off-site or into existing drainage facilities.



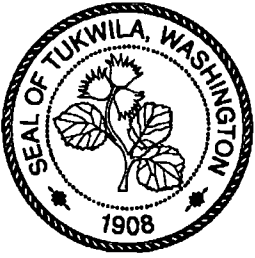
# City of Tukwila

## *Department of Community Development*

6300 Southcenter Boulevard, Suite #100  
Tukwila, Washington 98188  
Phone: 206-431-3670  
Fax: 206-431-3665  
Web site: <http://www.ci.tukwila.wa.us>

- 91: From October 1 through April 30, cover any slopes and stockpiles that are 3H:1V or steeper and have a vertical rise of 10 feet or more and will be unworked for greater than 12 hours. During this time period, cover or mulch other disturbed areas, if they will be unworked more than 2 days. Covered material must be stockpiled on site at the beginning of this period. Inspect and maintain this stabilization weekly and immediately before, during and following storms.
- 92: From May 1 through September 30, inspect and maintain temporary erosion prevention and sediment at least monthly. All disturbed areas of the site shall be permanently stabilized prior to final construction approval.
- 93: The site shall have permanent erosion control measures in place as soon as possible after final grading has been completed and prior to the Final Inspection.
- 94: Driveway modifications on S 152nd St shall be constructed in accordance with City standards. Driveways along Tukwila International Blvd shall be under City of SeaTac jurisdiction.
- 95: Driveway shall comply with City commercial standards. Driveway width shall be a 25' minimum and 35' maximum. Slope shall be a maximum of 15%. Turning radii shall be a minimum of 10'.
- 96: The driveway shall be designed and sloped so that drainage from the driveway does not flow onto the existing road surface.
- 97: Sidewalks and curb ramps along S 152nd St shall comply with City standards; Tukwila International Blvd frontal improvements under City of SeaTac jurisdiction.  
A separate ELECTRICAL PERMIT from City of Tukwila shall be obtained for one (1) street light installation on South 152nd Street.
- 98: All double check valve assemblies shall be approved by the State Department of Health.
- 99: It shall be verified in writing to the Utilities Inspector that the landscape irrigation system contains a State Department of Health approved double check valve assembly. This shall be done prior to the Final Inspection.
- 100: The new FRONTAL IMPROVEMENTS along South 152nd St shall be turned over to the City along with appropriate paperwork documentation prior to the Final Inspection.
- 101: Prior to final inspection applicant shall execute a sanitary sewer easement for City sewer system crossing McDonald's property. Applicant and/or property owner shall rescind any other easements that are no longer valid due to completion of the new construction.
- 102: Since more than one (1) acre of area will be disturbed as result of this development applicant shall obtain a construction NPDES permit from DOE.
- 103: Tukwila Plumbing inspection is required for water service between the WD #125 water meter and the building since WD #125 does not inspect downstream of the meter.
- 104: Prior to final permit signoff applicant shall record with King County Recorders Office storm drainage manual that spells out owners maintenance responsibilities. Applicant that pay the recording expences.

**\*\*continued on next page\*\***



# City of Tukwila

## *Department of Community Development*

6300 Southcenter Boulevard, Suite #100

Tukwila, Washington 98188

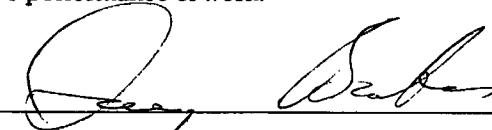
Phone: 206-431-3670

Fax: 206-431-3665

Web site: <http://www.ci.tukwila.wa.us>

I hereby certify that I have read these conditions and will comply with them as outlined. All provisions of law and ordinances governing this work will be complied with, whether specified herein or not.

The granting of this permit does not presume to give authority to violate or cancel the provision of any other work or local laws regulating construction or the performance of work.

Signature:  Date: 8/25/08

Print Name: Doug Brooks



**CITY OF TUKWILA**  
 Community Development Department  
 Public Works Department  
 Permit Center  
 6300 Southcenter Blvd., Suite 100  
 Tukwila, WA 98188  
<http://www.ci.tukwila.wa.us>

Building Permit No. 1208-243  
 Mechanical Permit No. \_\_\_\_\_  
 Plumbing/Gas Permit No. \_\_\_\_\_  
 Public Works Permit No. \_\_\_\_\_  
 Project No. PR010-053  
 (For office use only)

Applications and plans must be complete in order to be accepted for plan review.  
 Applications will not be accepted through the mail or by fax.  
 \*\*Please Print\*\*

**SITE LOCATION**

King Co Assessor's Tax No.: 0043000076, 80, 90  
 Site Address: 15210 TUKWILA INTERNATIONAL PL Suite Number: \_\_\_\_\_ Floor: \_\_\_\_\_  
 Tenant Name: MC DONALD'S CORP. LLC New Tenant:  ..... Yes  ..No  
 Property Owners Name: MC DONALD'S CORP. LLC  
 Mailing Address: 12131 113th AVE NE SUITE 103 KIRKLAND WA 98034  
City State Zip

**CONTACT PERSON – who do we contact when your permit is ready to be issued**

Name: DOUG BATES Day Telephone: 425.242.2411  
 Mailing Address: 12131 113th AVE NE SUITE 103 KIRKLAND WA 98034  
City State Zip  
 E-Mail Address: doug.bates@us.mcd.com Fax Number: 425.242.2498

**GENERAL CONTRACTOR INFORMATION – (Contractor Information for Mechanical (pg 4) for Plumbing and Gas Piping (pg 5))**

Company Name: TBD  
 Mailing Address: \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
 Contact Person: \_\_\_\_\_ Day Telephone: \_\_\_\_\_  
 E-Mail Address: \_\_\_\_\_ Fax Number: \_\_\_\_\_  
 Contractor Registration Number: \_\_\_\_\_ Expiration Date: \_\_\_\_\_

**ARCHITECT OF RECORD – All plans must be wet stamped by Architect of Record**

Company Name: WD PARTNERS  
 Mailing Address: 7007 DISCOVERY BLVD DUBLIN OH 43017  
City State Zip  
 Contact Person: CHRISTOPHER K DOERSCHLAG Day Telephone: \_\_\_\_\_  
 E-Mail Address: \_\_\_\_\_ Fax Number: \_\_\_\_\_

**ENGINEER OF RECORD – All plans must be wet stamped by Engineer of Record**

Company Name: D. R. STRONG CONSULTING ENGINEERS INC  
 Mailing Address: 10604 NE 38th PLACE #101 KIRKLAND WA 98033  
City State Zip  
 Contact Person: RICK OLSON P.E. Day Telephone: 425 827 3063  
 E-Mail Address: rick.olson@drstron.com Fax Number: 425 827 2423

**BUILDING PERMIT INFORMATION - 206-431-3670**

Valuation of Project (contractor's bid price): \$ 568,000 Existing Building Valuation: \$ \_\_\_\_\_

Scope of Work (please provide detailed information): REMOVAL OF EXISTING RESTAURANT (SEPARATE PERMIT)  
BUILDING & CONSTRUCTION OF NEW RESTAURANT STRUCTURE

Will there be new rack storage?  ..... Yes  ..... No If yes, a separate permit and plan submittal will be required.

**Provide All Building Areas in Square Footage Below**

|                         | Existing | Interior Remodel | Addition to Existing Structure | New  | Type of Construction per IBC | Type of Occupancy per IBC |
|-------------------------|----------|------------------|--------------------------------|------|------------------------------|---------------------------|
| 1 <sup>st</sup> Floor   |          |                  |                                | 5403 | VB                           | A2                        |
| 2 <sup>nd</sup> Floor   |          |                  |                                |      |                              |                           |
| 3 <sup>rd</sup> Floor   |          |                  |                                |      |                              |                           |
| Floors _____ thru _____ |          |                  |                                |      |                              |                           |
| Basement                |          |                  |                                |      |                              |                           |
| Accessory Structure*    |          |                  |                                |      |                              |                           |
| Attached Garage         |          |                  |                                |      |                              |                           |
| Detached Garage         |          |                  |                                |      |                              |                           |
| Attached Carport        |          |                  |                                |      |                              |                           |
| Detached Carport        |          |                  |                                |      |                              |                           |
| Covered Deck            |          |                  |                                |      |                              |                           |
| Uncovered Deck          |          |                  |                                |      |                              |                           |

**PLANNING DIVISION:**

Single family building footprint (area of the foundation of all structures, plus any decks over 18 inches and overhangs greater than 18 inches) \_\_\_\_\_

\*For an Accessory dwelling, provide the following:

Lot Area (sq ft): \_\_\_\_\_ Floor area of principal dwelling: \_\_\_\_\_ Floor area of accessory dwelling: \_\_\_\_\_

\*Provide documentation that shows that the principal owner lives in one of the dwellings as his or her primary residence.

Number of Parking Stalls Provided: Standard: 44 Compact: 15 Handicap: 4

Will there be a change in use?  ..... Yes  ..... No If "yes", explain: \_\_\_\_\_

**FIRE PROTECTION/HAZARDOUS MATERIALS:**

..... Sprinklers  ..... Automatic Fire Alarm  ..... None  ..... Other (specify) \_\_\_\_\_

Will there be storage or use of flammable, combustible or hazardous materials in the building?  ..... Yes  ..... No

If "yes", attach list of materials and storage locations on a separate 8-1/2" x 11" paper including quantities and Material Safety Data Sheets.

**SEPTIC SYSTEM**

..... On-site Septic System - For on-site septic system, provide 2 copies of a current septic design approved by King County Health Department.

**PUBLIC WORKS PERMIT INFORMATION - 206-433-0179**

Scope of Work (please provide detailed information): REMOVAL OF EXISTING IMPROVEMENTS ON STS  
& CONSTRUCTION OF NEW BLDG, STORM DRAINAGE SYSTEM, FRONTAGE IMPROVEMENTS  
SIDE SEWER, TRASH CORRAL & PARKING LOT.

Call before you Dig: 1-800-424-5555

Please refer to Public Works Bulletin #1 for fees and estimate sheet.

**Water District**

- ...Tukwila
- ...Water District #125
- .. Highline
- .. Renton
- ...Water Availability Provided

**Sewer District**

- ...Tukwila
- ...ValVue
- .. Renton
- .. Seattle
- ...Sewer Use Certificate
- ...Sewer Availability Provided

**Septic System:**

On-site Septic System - For on-site septic system, provide 2 copies of a current septic design approved by King County Health Department.

**Submitted with Application (mark boxes which apply):**

- ...Civil Plans (Maximum Paper Size - 22" x 34")
- ...Technical Information Report (Storm Drainage)
- ...Bond
- .. Insurance
- .. Easement(s)
- .. Geotechnical Report
- .. Maintenance Agreement(s)
- ...Traffic Impact Analysis
- ...Hold Harmless - (SAO)
- ...Hold Harmless - (ROW)

**Proposed Activities (mark boxes that apply):**

- ...Right-of-way Use - Nonprofit for less than 72 hours
- ...Right-of-way Use - No Disturbance
- ...Construction/Excavation/Fill - Right-of-way
- Non Right-of-way
- .. Right-of-way Use - Profit for less than 72 hours
- .. Right-of-way Use - Potential Disturbance

- ...Total Cut 2500 cubic yards
- ...Total Fill 2100 cubic yards
- .. Work in Flood Zone
- .. Storm Drainage

- ...Sanitary Side Sewer
- ...Cap or Remove Utilities
- ...Frontage Improvements
- ...Traffic Control
- ...Backflow Prevention - Fire Protection ✓"
- Irrigation ✓"
- Domestic Water \_\_\_\_\_"
- .. Abandon Septic Tank
- .. Curb Cut
- .. Pavement Cut
- .. Looped Fire Line
- .. Grease Interceptor
- .. Channelization
- .. Trench Excavation
- .. Utility Undergrounding

- ...Permanent Water Meter Size... 1 1/2" WO # \_\_\_\_\_
- ...Temporary Water Meter Size .. \_\_\_\_\_" WO # \_\_\_\_\_
- ...Water Only Meter Size..... \_\_\_\_\_" WO # \_\_\_\_\_
- ...Sewer Main Extension.....Public \_\_\_\_\_ Private ✓
- ...Water Main Extension.....Public \_\_\_\_\_ Private ✓
- ...Deduct Water Meter Size \_\_\_\_\_"

**FINANCE INFORMATION**

Fire Line Size at Property Line \_\_\_\_\_ Number of Public Fire Hydrant(s) \_\_\_\_\_

...Water       ...Sewer       ...Sewage Treatment

**Monthly Service Billing to:**

Name: \_\_\_\_\_ Day Telephone: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**Water Meter Refund/Billing:**

Name: \_\_\_\_\_ Day Telephone: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_



**PERMIT APPLICATION NOTES – Applicable to all permits in this application**

**Value of Construction** – In all cases, a value of construction amount should be entered by the applicant. This figure will be reviewed and is subject to possible revision by the Permit Center to comply with current fee schedules.

**Expiration of Plan Review** – Applications for which no permit is issued within 180 days following the date of application shall expire by limitation.

Building and Mechanical Permit

The Building Official may grant one or more extensions of time for additional periods not exceeding 90 days each. The extension shall be requested in writing and justifiable cause demonstrated. Section 105.3.2 International Building Code (current edition).

Plumbing Permit

The Building Official may grant one extension of time for an additional period not exceeding 180 days. The extension shall be requested in writing and justifiable cause demonstrated. Section 103.4.3 Uniform Plumbing Code (current edition).

I HEREBY CERTIFY THAT I HAVE READ AND EXAMINED THIS APPLICATION AND KNOW THE SAME TO BE TRUE UNDER PENALTY OF PERJURY BY THE LAWS OF THE STATE OF WASHINGTON, AND I AM AUTHORIZED TO APPLY FOR THIS PERMIT.

**BUILDING OWNER OR AUTHORIZED AGENT:**

Signature: T. W. Price (AGENT) Date: 4.30.08

Print Name: TRAVIS W PRICE Day Telephone: 425 827 3063

Mailing Address: 10604 NE 38th Place #101 Kirkland WA 98033  
City State Zip

|                            |                 |                           |                 |                 |            |
|----------------------------|-----------------|---------------------------|-----------------|-----------------|------------|
| Date Application Accepted: | <u>04/30/08</u> | Date Application Expires: | <u>10/30/08</u> | Staff Initials: | <u>JEW</u> |
|----------------------------|-----------------|---------------------------|-----------------|-----------------|------------|

BULLETIN A2  
 TYPE C PERMIT FEE ESTIMATE  
 PLAN REVIEW AND APPROVAL FEES DUE WITH APPLICATION  
*PW may adjust estimated fees*

PROJECT NAME Tukwila McDonalds PERMIT # 108-243

If you do not provide contractor bids or an engineer's estimate with your permit application, Public Works will review the cost estimates for reasonableness and may adjust estimates.

1. APPLICATION BASE FEE \$250 (1)
2. Enter total construction cost for each improvement category:
 

|                              |                |
|------------------------------|----------------|
| Mobilization                 | _____          |
| Erosion prevention           | _____          |
| Water/Sewer/Surface Water    | _____          |
| Road/Parking/Access          | _____          |
| <b>A. Total Improvements</b> | <u>208,697</u> |
3. Calculate improvement-based fees:
  - B. 2.5% of first \$100,000 of A. \_\_\_\_\_
  - C. 2.0% of amount over \$100,000, but less than \$200,000 of A. \_\_\_\_\_
  - D. 1.5% of amount over \$200,000 of A. \_\_\_\_\_
4. TOTAL PLAN REVIEW FEE (B+C+D) \$ \_\_\_\_\_ (4)
5. Enter total excavation volume 2500 cubic yards  
 Enter total fill volume 2100 cubic yards

Use the following table to estimate the grading plan review and permit fee.  
 Use the greater of the excavation and fill volumes.

| QUANTITY IN CUBIC YARDS | RATE  |
|-------------------------|---|
| Up to 50 CY             | Free  |
| 51 - 100                | \$23.50   |
| 101 - 1,000             | \$37.00   |
| 1,001 - 10,000          | \$49.25   |
| 10,001 - 100,000        | \$49.25 for 1 <sup>ST</sup> 10,000,<br>PLUS \$24.50 for each additional 10,000 or fraction thereof.   |
| 100,001 - 200,000       | \$269.75 for 1 <sup>ST</sup> 100,000,<br>PLUS \$13.25 for each additional 10,000 or fraction thereof. |
| 200,001 or more         | \$402.25 for 1 <sup>ST</sup> 200,000,<br>PLUS \$7.25 for each additional 10,000 or fraction thereof.  |

GRADING Plan Review and Permit Fees \$ \_\_\_\_\_ (5)

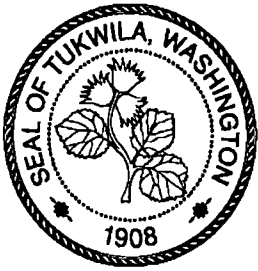
TOTAL PLAN REVIEW AND APPROVAL FEE DUE WITH PERMIT APPLICATION  
 (1+4+5) \$ \_\_\_\_\_

The Plan Review and Approval fees cover TWO reviews: 1) the first review associated with the submission of the application/plan and 2) a follow-up review associated with a correction letter. Each additional review, which is attributable to the Applicant's action or inaction shall be charged 25% of the Total Plan Review Fee.

**RECEIVED  
 CITY OF TUKWILA**

APR 30 2008

DOA-243



# City of Tukwila

## Department of Community Development

6300 Southcenter Boulevard, Suite #100  
Tukwila, Washington 98188  
Phone: 206-431-3670  
Fax: 206-431-3665  
Web site: <http://www.ci.tukwila.wa.us>

## RECEIPT

Parcel No.: 0043000096  
Address: 15210 TUKWILA INTERNATIONAL BL TUKW  
Suite No:  
Applicant: MCDONALD'S RESTAURANT

Permit Number: D08-243  
Status: ISSUED  
Applied Date: 04/30/2008  
Issue Date: 08/25/2008

Receipt No.: R09-00193

Payment Amount: \$60.00

Initials: JEM  
User ID: 1165

Payment Date: 02/04/2009 12:59 PM  
Balance: \$0.00

Payee: SPECTRUM ENTERPRISES

### TRANSACTION LIST:

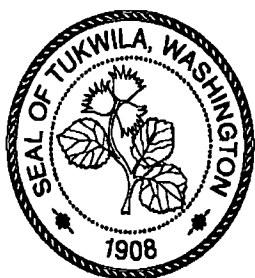
| Type    | Method | Descriptio | Amount |
|---------|--------|------------|--------|
| Payment | Cash   |            | 60.00  |

**PAYMENT  
RECEIVED**

### ACCOUNT ITEM LIST:

| Description         | Account Code | Current Pmts |
|---------------------|--------------|--------------|
| PLAN CHECK - NONRES | 000/345.830  | 60.00        |

**Total: \$60.00**



# City of Tukwila

## Department of Community Development

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Tukwila, Washington 98188  
Phone: 206-431-3670  
Fax: 206-431-3665  
Web site: <http://www.ci.tukwila.wa.us>

### SET RECEIPT

RECEIPT NO: R08-03043

Initials: JEM  
User ID: 1165

Payment Date: 08/25/2008  
Total Payment: 22,156.23

Payee: MCDONALD'S

SET ID: 0825

SET NAME: MCDONALDS

#### SET TRANSACTIONS:

| Set Member         | Amount           |
|--------------------|------------------|
| <del>D08-243</del> | 20,104.73        |
| D08-274            | 2,051.50         |
| <b>TOTAL:</b>      | <b>22,156.23</b> |

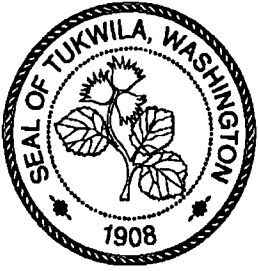
#### TRANSACTION LIST:

| Type          | Method | Description | Amount           |
|---------------|--------|-------------|------------------|
| Payment       | Check  | 40192249    | 22,156.23        |
| <b>TOTAL:</b> |        |             | <b>22,156.23</b> |

#### ACCOUNT ITEM LIST:

| Description              | Account Code | Current Pmts     |
|--------------------------|--------------|------------------|
| BUILDING - NONRES        | 000/322.100  | 6,658.23         |
| PW BASE APPLICATION FEE  | 000/322.100  | 250.00           |
| PW PERMIT/INSPECTION FEE | 000/342.400  | 7,855.00         |
| PW PLAN REVIEW           | 000/345.830  | 2,325.00         |
| STATE BUILDING SURCHARGE | 000/386.904  | 9.00             |
| TRAFFIC MITIGATION FEES  | 104.367.120  | 5,059.00         |
| <b>TOTAL:</b>            |              | <b>22,156.23</b> |

6593 08/25 9710 TOTAL 22156.23



# City of Tukwila

## Department of Community Development

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Tukwila, Washington 98188  
Phone: 206-431-3670  
Fax: 206-431-3665  
Web site: <http://www.ci.tukwila.wa.us>

## RECEIPT

Parcel No.: 0043000096  
Address: 15210 TUKWILA INTERNATIONAL BL TUKW  
Suite No:  
Applicant: MCDONALDS

Permit Number: D08-243  
Status: PENDING  
Applied Date: 04/30/2008  
Issue Date:

Receipt No.: R08-01429

Payment Amount: \$10,058.82

Initials: JEM  
User ID: 1165

Payment Date: 04/30/2008 02:57 PM  
Balance: \$11,365.73

Payee: D.R. STRONG

### TRANSACTION LIST:

| Type    | Method | Descriptio | Amount    |
|---------|--------|------------|-----------|
| Payment | Check  | 6613       | 10,058.82 |

### ACCOUNT ITEM LIST:

| Description             | Account Code | Current Pmts |
|-------------------------|--------------|--------------|
| BUILDING - NONRES       | 000/322.100  | 130.77       |
| PLAN CHECK - NONRES     | 000/345.830  | 3,875.30     |
| PW BASE APPLICATION FEE | 000/322.100  | 250.00       |
| PW LAND ALT PERMIT FEE  | 000/342.400  | 223.50       |
| PW LAND ALT PLAN REVIEW | 000/345.830  | 49.25        |
| PW PLAN REVIEW          | 000/345.830  | 5,530.00     |

**Total: \$10,058.82**

1860 05/01 9711 TOTAL 10058-82



**City of Tukwila**  
 6300 Southcenter Blvd, Suite 100  
 Tukwila, WA 98188  
 206-431-3670

## DEVELOPER'S PROJECT WARRANTY REQUEST FORM

### Section 1 – to be completed by Developer

Name of Development: MCDONALD RESTAURANT Date: 11 March 01  
 Address: 15210 PAC HWY 99 S Permit No.: DOB-243  
 Release should be sent to: Name: SPECTRUM ENTERPRISES  
 Address: 9810 48th AVE S  
 City/State/Zip: TACOMA, WA 98446  
 Phone Number: 253-539-4766

Description of items to be completed (reference plans/documents where items are described):

ASPHALT STAMPING AT DRIVE CROSSING  
PER PERMIT DOCUMENTS

As the owner, or authorized agent of the owner, I hereby submit cash or cash equivalent in the amount of \$ 2250 (150% of value to complete work above) and attach support documentation for value of work. I will have this work carried out and call for a final inspection by this date: April 30th, or risk having the City use these funds to carry out the work with their own contractor or in-house manpower. If I fail to carry out the work, I hereby authorize the City to go onto the property and carry out completion of the above deficiencies. I further agree to complete all work listed above prior to requesting inspection and release of these funds.

Signed: George Kobayashi  
 Title: Pres. SPT

### Section 2 – to be completed by City staff

**THIS FUND IS AUTHORIZED TO BE ACCEPTED**

Signed: \_\_\_\_\_ Department Head: \_\_\_\_\_  
 Amount: \$ 2250.00 Deposited this Date: \_\_\_\_\_  
 Cash/Check     Cash Assignment     Bond  
 City Receipt No.: PO9-00408 Received By: Marshall

### Section 3 – to be completed by Developer

All work identified in Section 1 of this form has now been completed and returned to department which authorized warranty. I hereby request inspection and release of my cash/cash equivalent/bond.

Developer's Representative: \_\_\_\_\_ Date: \_\_\_\_\_

#### To be completed by City staff

I have reviewed the above work and found it acceptable and therefore authorize the release of the above cash/cash equivalent/bond.

Inspector: \_\_\_\_\_ Date: \_\_\_\_\_ Authorized By: \_\_\_\_\_

### Section 4 – to be completed by City staff

Amount Released: \$ \_\_\_\_\_

Check - Check No. \_\_\_\_\_  Cash Equivalent – Letter attached  Bond – Letter attached

Date Released: \_\_\_\_\_ Released by: \_\_\_\_\_

**spectrum  
enterprises llc**

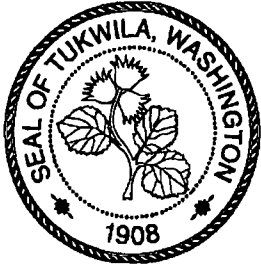
9810 48th avenue east  
tacoma, wa 98446  
253.539.4766 fax 253.539.4767  
wa lic: spectel968ma

March 16, 2009

RE: **McDonald's Restaurant #46-0005 (Riverton #00472)**  
**15210 Pacific Hwy South**  
**Tukwila, WA 98188**

50 feet of stamped concrete

| length | width | total | cost | total   |
|--------|-------|-------|------|---------|
| 50     | 5     | 250   | \$6  | \$1,500 |



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Address: 15210 TUKWILA INTERNATIONAL BL TUKW  
Suite No:  
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Permit Number: D08-243  
Status: ISSUED  
Applied Date: 04/30/2008  
Issue Date: 08/25/2008

Receipt No.: R09-00409

Payment Amount: \$2,250.00

Initials: JEM  
User ID: 1165

Payment Date: 03/16/2009 09:07 AM  
Balance: \$0.00

Payee: SPECTRUM ENTERPRISES

### TRANSACTION LIST:

| Type    | Method | Descriptio | Amount   |
|---------|--------|------------|----------|
| Payment | Check  | 2077       | 2,250.00 |

### ACCOUNT ITEM LIST:

| Description    | Account Code | Current Pmts |
|----------------|--------------|--------------|
| BONDS/DEPOSITS | 000.239.100  | 2,250.00     |

**Total: \$2,250.00**



#70  
INSPECTION NO.

INSPECTION RECORD  
Retain a copy with permit

008-243  
PERMIT NO.

*WR*

CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                               |  |
|-------------------------------|--|
| Project:<br><i>McDonald's</i> | Type of Inspection:<br><i>Final Building</i>       |
| Address:<br><i>15210 TIB</i>  | Date Called:                                       |
| Special Instructions:         | Date Wanted:<br><i>6-5-09</i> <del>a.m.</del> p.m. |
|                               | Requester:   |
|                               | Phone No:<br><i>253-377-2415</i>                   |

Approved per applicable codes.       Corrections required prior to approval.

COMMENTS:

*collections made*

*permit complete*

Inspector: *[Signature]*      Date: *6-5-09*

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.:      Date:

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **DJ8-213**

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                         |   |
|-------------------------|---|
| Project: <b>McDmlds</b> | Type of Inspection: <b>Plumbing Final</b>                     |
| Address: <b>T113</b>    | Date Called:  |
| Special Instructions:   | Date Wanted: <span style="float: right;">a.m.<br/>p.m.</span> |
|                         | Requester:  |
|                         | Phone No:   |

Approved per applicable codes.       Corrections required prior to approval.

**COMMENTS:**

*Bad con. replaced*

Inspector: **B. [Signature]**      Date: **6/14/01**

**\$60.00 REINSPECTION FEE REQUIRED.** Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.:      Date:

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **D08-243**

SB

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                                     |  |
|-------------------------------------|--|
| Project:<br><b>McDonald's Rest.</b> | Type of Inspection:<br><b>PW - Final</b>                   |
| Address:<br><b>15210 T.I.B.</b>     | Date Called:<br><b>6/4/09</b>                              |
| Special Instructions:               | Date Wanted:<br><b>6/5/09</b> <small>a.m.<br/>p.m.</small> |
|                                     | Requester:<br><b>George</b>                                |
|                                     | Phone No:<br><b>253-377-2415</b>                           |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

- Finalled

- Finalled

- Finalled

Inspector: **DS**

Date: **6/4/09**

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.:

Date:



**CITY OF TUKWILA**  
**PUBLIC WORKS ENGINEERING**  
6300 Southcenter Boulevard  
Tukwila, Washington 98188  
(206) 433-0179

## CORRECTION NOTICE

The following items are found to be deficient  
and not in accordance with the approved plans  
or City standards:

PERMIT NO. D08 - 243  
DATE: 3/24/09  
TIME: 3:30 pm  
JOB ADDRESS: 15216 Tukwila Int Blvd.

HW  
The truncated domes in the driveway approach  
of 15216 Ave need to be removed and  
replaced with concrete in accordance with Tukwila  
City Standard RS-09.

The truncated dome at the transition of sidewalk  
to asphalt (East end of sidewalk), needs to be removed  
or finished in "Erick Rd" color in accordance with  
Tukwila City Standard RS-12.

SIGNED: Dave Stuckle  
PUBLIC WORKS INSPECTOR

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **008-243**

WR

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                               |   |
|-------------------------------|---|
| Project:<br><b>McDonalds</b>  | Type of Inspection:<br><b>FINAL-PLANNING</b>                                  |
| Address:<br><b>13210 T2 B</b> | Date Called:  |
| Special Instructions:         | Date Wanted:<br><b>3-13-09</b> <span style="float:right">a.m.<br/>p.m.</span> |
|                               | Requester:  |
|                               | Phone No:<br><b>253-377-2415</b>  |

Approved per applicable codes.  Corrections required prior to approval.

**COMMENTS:**

① Landscaping looks good, no changes needed.

② Ped connection along north side is not installed per approved plans.

③ Ped connection ~~at~~ to dumpster not installed per approved plans.

Post bond for 15075 SF cost  
for item 2 & 3 in order to get  
CO. ~~Sub~~

Inspector: **[Signature]** Date: **3/13/09**

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.: \_\_\_\_\_ Date: \_\_\_\_\_

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

208-243  
PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|  |   |
|--|---|
| Project:<br>McDonald's                       | Type of Inspection:<br>PW Final                                     |
| Address:<br>15210 TIB                        | Date Called:<br>03/12/09  |
| Special Instructions:<br>OK to release bond? | Date Wanted:<br>03/13/09 <small>a.m.</small><br><small>p.m.</small> |
|  | Requester:<br>George  |
|  | Phone No:<br>253-377-2415   |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

LW  
FTH

- Finalled

CCAS

- Need sidewalk repairs on the corner of 152<sup>nd</sup> & TIB.

Information

- Contractor replaced wire to meet Tukwila standards. Finalled

PW  
Final

- Pending sidewalk repairs.

|                  |                  |
|------------------|------------------|
| Inspector:<br>DS | Date:<br>3/13/09 |
|------------------|------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

7  
0

# INSPECTION RECORD

Retain a copy with permit

D08-243

RR

INSPECTION NO.

PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                                     |   |
|-------------------------------------|---|
| Project:<br><i>MACDONALDS Rest.</i> | Type of Inspection:<br><i>Final-Build</i>                                     |
| Address:<br><i>15210 TIB</i>        | Date Called:  |
| Special Instructions:               | Date Wanted:<br><i>3-13-09</i> <span style="float:right">a.m.<br/>p.m.</span> |
|                                     | Requester:  |
|                                     | Phone No:<br><i>253-377-2415</i>  |

Approved per applicable codes.

Corrections required prior to approval.

**COMMENTS:**

*① Spoke with General on phone  
Fire Department planning Dept,  
and public works has NOT  
been out as of yet  
\*INSTRUCTED contractor TO  
re-schedule AFTER remaining  
DEPARTMENTS have been approved.*

|                                  |                         |
|----------------------------------|-------------------------|
| Inspector:<br><i>[Signature]</i> | Date:<br><i>3-13-09</i> |
|----------------------------------|-------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#19

## INSPECTION RECORD

Retain a copy with permit

DOB-243

INSPECTION NO.

PERMIT NO.

B

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                             |  |
|-----------------------------|--|
| Project:<br>MCDONALDS Rest. | Type of Inspection:<br>FINAL & GLAZING |
| Address:<br>15210 TIB       | Date Called:<br>2/20/09                |
| Special Instructions:       | Date Wanted:<br>2/23/09                |
|                             | Requester:<br>a.m.<br>p.m.             |
|                             | Phone No:<br>253-377-2415              |

 Approved per applicable codes. Corrections required prior to approval.

COMMENTS: TCO FOR 21 DAYS ONLY!!  
OK TO OPEN TO PUBLIC

- ① NEED FIRE FINAL
- ② NEED PUBLIC WORKS FINAL
- ③ NEED PLANNING FINAL
- ④ NEED MECHANICAL FINAL MO8-131
- ⑤ COMPLETE GROUTING OF ALL EXTERIOR LIGHT POST
- ⑥ NEED PLACARD STATING OCCUPANT LOADING PERIOD. THERE IS TEMPORARY LOADING SIGNS ON BASIS THAT THE FIRE DEPARTMENT APPROVED

~~⑦~~ \* GLAZING APPROVED

|                          |                  |
|--------------------------|------------------|
| Inspector:<br>Carol Mena | Date:<br>2-23-09 |
|--------------------------|------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|



INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **008-243**

SB

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                                 |   |
|---------------------------------|---|
| Project:<br><b>McDonald's</b>   | Type of Inspection:<br><b>RW Final</b>  |
| Address:<br><b>15210 T.I.B.</b> | Date Called:<br><b>2/20/09</b>  |
| Special Instructions:           | Date Wanted:<br><b>2/23/09</b> <span style="float:right">a.m.<br/>p.m.</span> |
|                                 | Requester:<br><b>George</b>   |
|                                 | Phone No:<br><b>253-377-2415</b>  |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

LW  
BFI  
LI  
CCAS  
SD  
SU  
TESC  
PESC  
GT  
PAVE  
ILLUM  
BFF  
LA

|   |
|---|
| <b>- Finalled, test report received</b> |
| <b>- Finalled</b>                       |
| <b>- Bonded, not complete</b>           |
| <b>- Finalled</b>                       |
| <b>- Finalled</b>                       |
| <b>- Finalled</b>                       |
| <b>- Finalled</b>                       |
| <b>- Finalled</b>                       |

|                         |                         |
|-------------------------|-------------------------|
| Inspector:<br><b>DS</b> | Date:<br><b>2/23/09</b> |
|-------------------------|-------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

INSPECTION NO.

# INSPECTION RECORD

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PERMIT NO. **D08-243**

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                              |  |
|------------------------------|--|
| Project:<br><b>McDonalds</b> | Type of Inspection:<br><b>PW Final</b>             |
| Address:<br><b>15210 TIB</b> | Date Called:<br><b>2/20/09</b>                     |
| Special Instructions:        | Date Wanted:<br><b>2/23/09</b> <small>a.m.</small> |
|                              | Requester:<br><b>George</b>                        |
|                              | Phone No:  |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

Pave

ILL

BFF

LA

PW Final

- Finalled
- Bonded, not complete
- Finalled, test report received
- Finalled
- Pending completion of 152<sup>nd</sup> st frontage improvements, street light on 152<sup>nd</sup>, & receipt of AS-builts & Fire system certs within 14 days of this report.

|                         |                         |
|-------------------------|-------------------------|
| Inspector:<br><b>DS</b> | Date:<br><b>2/23/09</b> |
|-------------------------|-------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **D08-243**

*[Handwritten signature]*

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                            |  |
|----------------------------|--|
| Project: <b>McDonald's</b> | Type of Inspection: <b>Final planning</b>    |
| Address: <b>15210 TIB</b>  | Date Called:                                 |
| Special Instructions:      | Date Wanted: <b>2-20-09</b> a.m. <u>p.m.</u> |
|                            | Requester:                                   |
|                            | Phone No: <b>253-377-2415</b>                |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

**Leadsealing not installed. TCO okay**

*[Handwritten: 670]*

*[Handwritten: 263]*

|   |                      |
|---|----------------------|
| Inspector: <i>[Handwritten Signature]</i> | Date: <b>2/20/09</b> |
|---|----------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#18  
INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

008-243  
PERMIT NO.

**CITY OF TUKWILA BUILDING DIVISION**  
6300 Southcenter Blvd., #100, Tukwila, WA 98188 (206)431-3670

|                        |                                       |
|------------------------|---------------------------------------|
| Project:<br>McDonald's | Type of Inspection:<br>Final Building |
| Address:<br>15210 TIB  | Date Called:<br>6/24/09               |
| Special Instructions:  | Date Wanted:<br>7-20-09 a.m.<br>p.m.  |
|                        | Requester:                            |
|                        | Phone No:<br>206-377-2415             |

Approved per applicable codes.

Corrections required prior to approval.

**COMMENTS:**

This is for ~~stocking~~ stocking  
 employees on site only  
 during daylight hours only

NO occupancy until  
 Health Department electrical  
 life/safety has been approved  
 & fire finished out.

\* Contractor has been warned not  
 to open to the public. open for  
 employee training & stocking daylight  
 hours only.

|                         |                  |
|-------------------------|------------------|
| Inspector:<br>Carol May | Date:<br>7-20-09 |
|-------------------------|------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#151

# INSPECTION RECORD

Retain a copy with permit

008-243

INSPECTION NO.

PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                            |   |
|----------------------------|---|
| Project: <i>McDonald's</i> | Type of Inspection: <i>Suspended ceiling</i>                                |
| Address: <i>15210 TIB</i>  | Date Called:  |
| Special Instructions:      | Date Wanted: <i>2-4-09</i> <span style="float: right;">a.m.<br/>p.m.</span> |
|                            | Requester:  |
|                            | Phone No:   |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

*Have elect, mech. & sprinkler covers.*

*OK TO COVER*

|                              |                     |
|------------------------------|---------------------|
| Inspector: <i>Carol Hurd</i> | Date: <i>2-4-09</i> |
|------------------------------|---------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#16

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

008-243

PERMIT NO.

*DL*

*15*

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                               |  |
|-------------------------------|--|
| Project:<br><i>McDonald's</i> | Type of Inspection:<br><i>EXT. WALL Shearwall</i>          |
| Address:<br><i>15210 TIB</i>  | Date Called:   |
| Special Instructions:         | Date Wanted:<br><i>1-6-09</i> <small>a.m.<br/>p.m.</small> |
|                               | Requester:   |
|                               | Phone No:  |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

*All nailing inspections have been completed. Last portion was on 1-6-09 for remaining @ ply wpa*

Inspector:

*Carl H.*

Date:

*2-4-09*

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.:

Date:

#15  
INSPECTION NO.

INSPECTION RECORD  
Retain a copy with permit

DOB-243  
PERMIT NO.

WR

CITY OF TUKWILA BUILDING DIVISION  
6300 Southcenter Blvd., #100, Tukwila, WA 98188 (206)431-3670

|                       |   |
|-----------------------|---|
| Project:<br>MCDONALDS | Type of Inspection:<br>SUSPENDED CEILING                                |
| Address:<br>15210 TLB | Date Called:  |
| Special Instructions: | Date Wanted:<br>1-6-09 <span style="float: right;">a.m.<br/>p.m.</span> |
|                       | Requester:  |
|                       | Phone No:<br>253-377-2415   |

Approved per applicable codes.  Corrections required prior to approval. →

COMMENTS:

PARTIAL APPROVAL  
play area only -

① Will need to do 1" annular  
space w/ie suppression prior to  
Final

Inspector: *[Signature]* Date: 1-6-09

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.: Date:

#14

INSPECTION NO.

INSPECTION RECORD

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008-243

PERMIT NO.

CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                        |   |
|------------------------|---|
| Project:<br>McDonald's | Type of Inspection:<br>WALL SHEATHING                                   |
| Address:<br>15210 TIB  | Date Called:  |
| Special Instructions:  | Date Wanted:<br>12-30-08 <span style="float:right">a.m.<br/>p.m.</span> |
|                        | Requester:  |
|                        | Phone No:<br>253-377-2415   |

Approved per applicable codes.

Corrections required prior to approval.

COMMENTS:

STUCCO IS COMPLETE - OK TO COVER

|                         |                   |
|-------------------------|-------------------|
| Inspector:<br>Curt Ward | Date:<br>12-30-08 |
|-------------------------|-------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|



#13

# INSPECTION RECORD

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008-243

INSPECTION NO.

PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                        |   |
|------------------------|---|
| Project:<br>McDonald's | Type of Inspection:<br>WALL INSULATION  |
| Address:<br>15210 TIB  | Date Called:  |
| Special Instructions:  | Date Wanted:<br>12-17-08 <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">a.m.</span><br>p.m. |
|                        | Requester:  |
|                        | Phone No:<br>253-377-2415   |

Approved per applicable codes.

Corrections required prior to approval.

COMMENTS:

LAST portion @ play

NCA. OK

|                                 |                   |
|---------------------------------|-------------------|
| Inspector:<br><i>Carol M...</i> | Date:<br>12-17-08 |
|---------------------------------|-------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#12  
INSPECTION NO.

**INSPECTION RECORD**  
Retain a copy with permit

008 243  
PERMIT NO.

*rk*

**CITY OF TUKWILA BUILDING DIVISION**

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                             |  |
|-----------------------------|--|
| Project: <i>Mc DONALD'S</i> | Type of Inspection: <i>framing &amp; stucco</i>      |
| Address: <i>15210 TIB</i>   | Date Called:   |
| Special Instructions:       | Date Wanted: <i>12-15 of</i> <u>a.m.</u> <u>p.m.</u> |
|                             | Requester:   |
|                             | Phone No:  |

Approved per applicable codes.

Corrections required prior to approval.

*X*

**COMMENTS:**

*\* Framing @ play area is approved for cover - All previous corrections have been approved by special inspections.*

*partial approval only on stucco. area that is incomplete is btw. driveway windows on north side.*

Inspector: *[Signature]* Date: *12-15-08*

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.: Date:

INSPECTION NO.

# INSPECTION RECORD

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PERMIT NO. **D08-243**

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                                 |   |
|---------------------------------|---|
| Project:<br><b>McDonalds</b>    | Type of Inspection:<br><b>SD</b>  |
| Address:<br><b>15210 T.I.B.</b> | Date Called:<br><b>12/11/08</b>   |
| Special Instructions:           | Date Wanted:<br><b>12/12/08</b> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">7 m.<br/>p.m.</span> |
|                                 | Requester:<br><b>George</b>   |
|                                 | Phone No:   |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

tw

sb - Downspouts installed per plans/details. OK to backfill.

|                         |                          |
|-------------------------|--------------------------|
| Inspector:<br><b>DS</b> | Date:<br><b>12/12/08</b> |
|-------------------------|--------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#11  
INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

D08243  
PERMIT NO.

**CITY OF TUKWILA BUILDING DIVISION**  
6300 Southcenter Blvd., #100, Tukwila, WA 98188 (206)431-3670

|   |   |
|---|---|
| Project:<br>McDONALDS   | Type of Inspection:<br>FRAMING  |
| Address:<br>15210 TRB   | Date Called:  |
| Special Instructions:<br>7 <sup>00</sup> A.M.<br>check all special<br>inspect. reports. | Date Wanted:<br>12/11/08 <span style="float:right">a.m.<br/>p.m.</span> |
|   | Requester:  |
|   | Phone No:<br>253-377-2415   |

Approved per applicable codes.  Corrections required prior to approval.

**COMMENTS:** DO NOT MOVE FORWARD!!

Tukwila inspector has determined AFTER reading SITE special inspection reports that there are deficiencies on structural steel inspections & Anchor Bolt Tension psi. These were to be continuous inspections. And they have not (or can't find record) of approval. \*slip critical connection

\*Tukwila Building Dept. will NOT allow contractor to move forward until these items have been addressed

\*inspector will check reports @ office. they may be more ledgeble.

Inspector: Carol Fox Date: 12-12-08

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.: Date:

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. 008-243

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                       |                                   |
|-----------------------|-----------------------------------|
| Project: Mr Don ADS   | Type of Inspection: WMI Sheathing |
| Address: 15210 TIB    | Date Called:                      |
| Special Instructions: | Date Wanted: 12-12-08 a.m. p.m.   |
|                       | Requester:                        |
|                       | Phone No: 253-377-2415            |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

Don't let them cover until special inspection resolved

o:dn do inspection

Inspector: *Carroll* Date: 12-12-08

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.: Date:

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **D08-243**

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                                 |  |
|---------------------------------|--|
| Project:<br><b>McDonalds</b>    | Type of Inspection:<br><b>SD</b>   |
| Address:<br><b>15210 T.I.B.</b> | Date Called:<br><b>12/8/08</b>   |
| Special Instructions:           | Date Wanted:<br><b>12/8/08</b> <span style="float:right">a.m.<br/><u>p.m.</u></span> |
|                                 | Requester:<br><b>Kelley</b>  |
|                                 | Phone No:  |

Approved per applicable codes.

Corrections required prior to approval.

*LW*

### COMMENTS:

SD - installed and set pipe  
between CB#7 & CB#9.  
OK to backfill.

|                         |                         |
|-------------------------|-------------------------|
| Inspector:<br><b>DS</b> | Date:<br><b>12/8/08</b> |
|-------------------------|-------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
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# INSPECTION RECORD

Retain a copy with permit

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|---------|
| D08-243 |
|---------|

INSPECTION NO.

PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                          |  |
|--------------------------|--|
| Project:<br>McDonalds    | Type of Inspection:<br>SD, FLH                         |
| Address:<br>15210 T.I.B. | Date Called:<br>12/4/08                                |
| Special Instructions:    | Date Wanted:<br>12/4/08 <sup>a.m.</sup><br><u>p.m.</u> |
|                          | Requester:<br>George                                   |
|                          | Phone No:  |

 Approved per applicable codes. Corrections required prior to approval.

### COMMENTS:

hw

SD - Observed connection from CB#10 to CB#11, and from CB#11 to existing CB#101. OK to backfill.

FLH - Observed restraints on the 90° elbow beneath the slab going up to the floor flange. Rods & mega lugs. OK to backfill.

|                  |                  |
|------------------|------------------|
| Inspector:<br>DS | Date:<br>12/4/08 |
|------------------|------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
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#10  
INSPECTION NO.

**INSPECTION RECORD**  
Retain a copy with permit

D08-243  
PERMIT NO.

**CITY OF TUKWILA BUILDING DIVISION**

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                       |   |
|-----------------------|---|
| Project:<br>McDonalds | Type of Inspection:<br>WALL INS   |
| Address:<br>15210 TIB | Date Called:  |
| Special Instructions: | Date Wanted:<br>12/01/08 <span style="float:right">a.m.<br/>p.m.</span> |
|                       | Requester:  |
|                       | Phone No:<br>253-377-2415   |

Approved per applicable codes.       Corrections required prior to approval. 7

**COMMENTS:**

PARTIAL APPROVAL

OK FIRST OF GRID "D"

|                                  |                  |
|----------------------------------|------------------|
| Inspector:<br><i>[Signature]</i> | Date:<br>12-1-08 |
|----------------------------------|------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

9  
INSPECTION NO.

**INSPECTION RECORD**  
Retain a copy with permit

DOB-243  
PERMIT NO.

WR

**CITY OF TUKWILA BUILDING DIVISION**

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                               |  |
|-------------------------------|--|
| Project:<br><i>McDonald's</i> | Type of Inspection:<br><i>409 Framing</i>            |
| Address:<br><i>15210 TIB</i>  | Date Called:   |
| Special Instructions:         | Date Wanted:<br><i>11-26-08</i> <sup>a.m.</sup> p.m. |
|                               | Requester:   |
|                               | Phone No:  |

Approved per applicable codes.

Corrections required prior to approval.

COMMENTS: *PA*

*Ok to insulate east of grid line D*

*See report #8*

|                                  |                          |
|----------------------------------|--------------------------|
| Inspector:<br><i>[Signature]</i> | Date:<br><i>11-26-08</i> |
|----------------------------------|--------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#8  
INSPECTION NO.

INSPECTION RECORD  
Retain a copy with permit

DOB-243  
PERMIT NO.

WR

CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|   |                                       |
|---|---------------------------------------|
| Project:<br>MCDONALD RESTAURANT   | Type of Inspection:<br>FRAMING E      |
| Address:<br>15210 TIB   | Date Called:<br>WALL INSULATION       |
| Special Instructions:<br>* check for sprinklers<br>above & below ceiling.<br>or DRAFTING ABOVE. | Date Wanted:<br>11/24/08 a.m.<br>p.m. |
|   | Requester:                            |
|   | Phone No:<br>253-377-2415             |

Approved per applicable codes.

Corrections required prior to approval. //

COMMENTS:

\* Re-check lateral nailing @ Nusses.

\* PARTIAL APPROVAL ON EXTERIOR WALLS ONLY!!

DO NOT INSULATE UNTIL THE EXTERIOR IS WEATHERED IN. CALL BACK FOR RE-INSPECTION OF EXTERIOR WRAP PRIOR TO INSULATION.

|                          |                   |
|--------------------------|-------------------|
| Inspector:<br>Carol Mack | Date:<br>11-24-08 |
|--------------------------|-------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#1

# INSPECTION RECORD

Retain a copy with permit

008-243

INSPECTION NO.

PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                               |                                |
|-------------------------------|--------------------------------|
| Project:<br>Mr. Donald's Res. | Type of Inspection:<br>Framing |
| Address:<br>15210 TIB         | Date Called:                   |
| Special Instructions:         | Date Wanted:<br>11-21-08 a.m.  |
|                               | Requester:                     |
|                               | Phone No:<br>253-377-2415      |

Approved per applicable codes.  Corrections required prior to approval. 10

COMMENTS: DO NOT COVER

① NEED TO FIRE BLOCK @ ALL VERTICAL PENETRATIONS INTO CONCEALED SPACE ABOVE.

② NEED TWO 10D NAILS @ ALL TRUSSES FOR LATERAL BRACING. THERE IS ONLY ONE NAIL THROUGHOUT.

Inspector: *Carol M...* Date: 11-21-08

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.: Date:

#p

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

DOB-243

PERMIT NO.

WR

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                       |   |
|-----------------------|---|
| Project:<br>McDONALD  | Type of Inspection:<br>WALL Sheathing/Shear                             |
| Address:<br>13210 TIB | Date Called:  |
| Special Instructions: | Date Wanted:<br>11/20/08 <span style="float:right">a.m.<br/>p.m.</span> |
|                       | Requester:  |
|                       | Phone No:<br>253-377-2415   |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

PARTIAL APPROVAL

OK TO COVER EVERYTHING WITH THE EXCEPTION OF 1 Along AREA - WEST UPPER SIDE.

Anchor Bolt Washers have been changed out to 3" @ Shear WALLS.

1 will look for 3x6 on North Side of Building @ Framing Along with 4' Foot or center missing anchor Bolts.

Inspector:

Carl M

Date:

11-20-08

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.:

Date:

#5  
INSPECTION NO.

**INSPECTION RECORD**  
Retain a copy with permit

DOB-243  
PERMIT NO.

**CITY OF TUKWILA BUILDING DIVISION**

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                        |   |
|------------------------|---|
| Project:<br>Mc Donalds | Type of Inspection:<br>Wall Ins.  |
| Address:<br>15210 TIB  | Date Called:  |
| Special Instructions:  | Date Wanted:<br>11-17-08 <span style="float:right">a.m.<br/>p.m.</span> |
|                        | Requester:  |
|                        | Phone No:<br>352-377-2415   |

Approved per applicable codes.

Corrections required prior to approval.

COMMENTS:

partial Approval

Behind Switchgear @ Electrical ROOM - ONLY !!

|                                     |                |
|-------------------------------------|----------------|
| Inspector: <i>Carol [Signature]</i> | Date: 11-17-08 |
|-------------------------------------|----------------|

\$60.00 REINSPECTION FEE REQUIRED..Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#4  
INSPECTION NO.

INSPECTION RECORD  
Retain a copy with permit

D08-243  
PERMIT NO.

CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                       |   |
|-----------------------|---|
| Project:<br>MCDONALDS | Type of Inspection:<br>WALL SHEATHING                                   |
| Address:<br>15210 TLR | Date Called:  |
| Special Instructions: | Date Wanted:<br>11/14/08 <span style="float:right">a.m.<br/>p.m.</span> |
|                       | Requester:  |
|                       | Phone No:<br>253-377-2415   |

Approved per applicable codes.

Corrections required prior to approval.

COMMENTS:

1) DO NOT COVER. Detail on S301/10 requires 5/8" strap @ 3" wide. The wrong strap is on right now. There should be 18 ea 3/4" bolts. LEAVE washers & nuts off so inspector can insure that holes are not oblong.

2) 3"X3" plate washers to be installed @ shear walls. There are currently 1 1/2" X 1 1/2" plate washers.

\* CONTRACTOR HAS OPTION TO HAVE ENGINEER TURN IN REVISION FOR WHAT HAS BEEN INSTALLED

Inspector: *Carol M...*

Date: 11-14-08

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.:

Date:

INSPECTION NO.

# INSPECTION RECORD

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PERMIT NO. **D08-243**

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                              |   |
|------------------------------|---|
| Project: <b>McDonalds</b>    | Type of Inspection: <b>SD</b>                         |
| Address: <b>15210 T.I.B.</b> | Date Called: <b>11/14/08</b>                          |
| Special Instructions:        | Date Wanted: <b>11/14/08</b> <small>a.m./p.m.</small> |
|                              | Requester: <b>George</b>                              |
|                              | Phone No: <b>253-377-2415</b>                         |

Approved per applicable codes.

Corrections required prior to approval.

hw

**COMMENTS:**

**SD - CB # 10 set and installed per plan with fabric around pipe. OK to backfill**

**CB # 1 connected to detention system per plan - OK to backfill.**

|                      |                       |
|----------------------|-----------------------|
| Inspector: <b>DS</b> | Date: <b>11/14/08</b> |
|----------------------|-----------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|



3  
INSPECTION NO.

**INSPECTION RECORD**  
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DOB-243  
PERMIT NO.

**CITY OF TUKWILA BUILDING DIVISION**  
6300 Southcenter Blvd., #100, Tukwila, WA 98188 (206)431-3670

|                          |   |
|--------------------------|---|
| Project:<br>MCDONALD RST | Type of Inspection:<br>ROOF SHEATHING                                   |
| Address:<br>15210 TIB    | Date Called:  |
| Special Instructions:    | Date Wanted:<br>11-13-09 <span style="float:right">a.m.<br/>p.m.</span> |
|                          | Requester:  |
|                          | Phone No:<br>253-377-2415   |

Approved per applicable codes.       Corrections required prior to approval.

**COMMENTS:**

① Roof Sheathing Complete

|                                  |                   |
|----------------------------------|-------------------|
| Inspector:<br><i>[Signature]</i> | Date:<br>11-13-09 |
|----------------------------------|-------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

#2  
INSPECTION NO.

INSPECTION RECORD  
Retain a copy with permit

008-243  
PERMIT NO.

CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|  |                                       |
|--|---------------------------------------|
| Project:<br>Mc Donald's                          | Type of Inspection:<br>Roof Sheathing |
| Address:<br>15210 TIB                            | Date Called: .                        |
| Special Instructions:<br>253-539<br>4764<br>4767 | Date Wanted:<br>11-6-08 a.m.<br>p.m.  |
|  | Requester:                            |
|  | Phone No:<br>253-377-2341             |

Approved per applicable codes.

Corrections required prior to approval.

COMMENTS: Partial Approval only!!  
 3x4 Blocking Approved  
 #7 9" o.c @ 12  
 #5 6' @ 12  
 #9 6' @ 12  
 EAST end for 1<sup>st</sup> 6 BAYS  
 FROM Grid A FOR 7 BAYS EAST Grid A  
 2 BAYS WEST  
 FOR Grid line D EAST @ 3 BAYS.  
 \* Inspected west of Grid A - DRAG SWAMP  
 3 ea MST-60 @ LSC correct...  
 HAVE curbs already SET. ALSO 1/4" S&W  
 screws 6" o.c. \* They ALSO HAVE A  
 Special Inspector doing roof shear & WALL.

|                       |                  |
|-----------------------|------------------|
| Inspector:<br>C and M | Date:<br>11-6-08 |
|-----------------------|------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **D08-243**

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila. WA 98188

(206) 431-3670

Permit Inspection Request Line (206) 431-2451

|   |  |
|---|--|
| Project:<br><b>McDonald's</b>   | Type of Inspection:<br><b>Bond Release</b> |
| Address:<br><b>15210 TIB</b>  | Date Called:                               |
| Special Instructions:<br><b>2 year maint bond<br/>PW Final 06/04/09</b> | Date Wanted: . a.m.<br>p.m.                |
|   | Requester:                                 |
|   | Phone No:                                  |

lw

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

OK to release bond.

Inspector: **DS**

Date: **5/26/11**

**REINSPECTION FEE REQUIRED.** Prior to next inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

INSPECTION NO.

# INSPECTION RECORD

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D08-243  
PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                               |   |
|-------------------------------|---|
| Project:<br><i>McDonald's</i> | Type of Inspection:<br><i>SD</i>  |
| Address:<br><i>15210 TIB</i>  | Date Called:<br><i>11/5/08</i>  |
| Special Instructions:         | Date Wanted:<br><i>11/6/08</i> <span style="float: right;">(a.m.)<br/>p.m.</span> |
|                               | Requester:<br><i>George</i>   |
|                               | Phone No:<br><i>253-377-2415</i>  |

Approved per applicable codes.

Corrections required prior to approval.

COMMENTS:

*hw*

*SD* - OK to backfill detention system with drain rock.

Call for inspection prior to placing any other material on top of rock.

|                          |                         |
|--------------------------|-------------------------|
| Inspector:<br><i>JDS</i> | Date:<br><i>11/6/08</i> |
|--------------------------|-------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

INSPECTION NO.

# INSPECTION RECORD

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D08-243  
PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                           |   |
|---------------------------|---|
| Project: <b>McDonalds</b> | Type of Inspection: <b>SD</b>                         |
| Address:                  | Date Called: <b>10/16/08</b>                          |
| Special Instructions:     | Date Wanted: <b>10/17/08</b> <small>a.m. p.m.</small> |
|                           | Requester: <b>Kelly</b>                               |
|                           | Phone No:   |

Approved per applicable codes.  Corrections required prior to approval.

COMMENTS: **On-site to inspect condition of CB-105 (72") after repairs to structure due to excessive cracking & spalling. Contractor placed 2 yd of concrete around the structure to act as a sleeve and reinstate the structural integrity of the structure. Repairs looked good. OK to start backfilling.**

Inspector: **[Signature]** Date: **10/17/08**

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.: Date:

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **D08-243**

SB

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|   |  |
|---|--|
| Project:<br><b>McDonald's</b>           | Type of Inspection:<br><b>SD</b>           |
| Address:<br><b>15210 T.I.B.</b>         | Date Called:<br><b>10/8/08</b>             |
| Special Instructions:<br><b>late Am</b> | Date Wanted:<br><b>10/9/08</b> (a.m. p.m.) |
|   | Requester: <b>Ken 253-330-4831</b>         |
|   | Phone No:<br><b>OR Kelly 425-244-7724</b>  |

Approved per applicable codes.

Corrections required prior to approval.

HW  
SD

**COMMENTS:**

**10/9/08 arrived @ 12:35 PM. Contractor NOT Ready.**

Inspector: **[Signature]** Date: **10/9/08**

\$60:00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.: \_\_\_\_\_ Date: \_\_\_\_\_

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

008-243

PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                                  |   |
|----------------------------------|---|
| Project:<br><i>MacDonalds</i>    | Type of Inspection:<br><i>SU</i>                              |
| Address:<br><i>15210 PAC Hwy</i> | Date Called:  |
| Special Instructions:            | Date Wanted: <span style="float: right;">a.m.<br/>p.m.</span> |
|                                  | Requester:  |
|                                  | Phone No:   |

Approved per applicable codes.

Corrections required prior to approval.

COMMENTS:

*1w*

*SU*

*10/6/08 OK for requested 2-3/hr  
Truck/Trailer Hauler onto  
S. 152 East Bound Then South  
on 40th ave So. Then West  
TO PAC. HWY S.  
Contact Kinges (Sand Transit &  
Request same approval.  
ONGOING  
STREET CLEANING required*

|                         |                         |
|-------------------------|-------------------------|
| Inspector:<br><i>EW</i> | Date:<br><i>10/6/08</i> |
|-------------------------|-------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

1

# INSPECTION RECORD

008-243

INSPECTION NO.

Retain a copy with permit

PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

KR

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|  |  |
|--|--|
| Project:<br>Mc Donalds                             | Type of Inspection:<br>FOOTING   |
| Address:<br>15210 TIB                              | Date Called: --  |
| Special Instructions:<br><br>Special Krizan<br>7am | Date Wanted:<br>10/2/08 <span style="float:right">a.m.<br/>p.m.</span> |
|  | Requester:   |
|  | Phone No:<br>253-330-4831  |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

Special Concrete Re-steel  
by Krizan

|                |                  |
|----------------|------------------|
| Inspector:<br> | Date:<br>10/2/08 |
|----------------|------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|



INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

008-243

PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                              |   |
|------------------------------|---|
| Project:<br><i>McDonalds</i> | Type of Inspection:<br><i>SD</i>                    |
| Address:                     | Date Called:<br><i>9/25/08</i>                      |
| Special Instructions:        | Date Wanted:<br><i>    "    "    "</i> a.m.<br>p.m. |
|                              | Requester:<br><i>George</i>                         |
|                              | Phone No:   |

Approved per applicable codes.       Corrections required prior to approval.

**COMMENTS:**

*SD* *9/25/08* set CB #3 & complete 12" SD FROM CB #2, begin 12" FROM CB #3 NORTH.

*9/29/08* complete 12" FROM CB #3, set CB 4 & connect, OK

*9/30/08* set CB 6 & complete 12" SD FROM CB 2.

Inspector: *GW*      Date: *9/30/08*

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

Receipt No.:      Date:

# 1

# INSPECTION RECORD

Retain a copy with permit

D08-243

WR

INSPECTION NO.

PERMIT NO.

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                       |                                   |
|-----------------------|-----------------------------------|
| Project:<br>McDon-15  | Type of Inspection:<br>PRE-COAST  |
| Address:<br>15210 TIB | Date Called:                      |
| Special Instructions: | Date Wanted: 9-26-08 a.m.<br>p.m. |
|                       | Requester:                        |
|                       | Phone No:                         |

Approved per applicable codes.

Corrections required prior to approval.

COMMENTS:

Went over all conditions  
\* Inspections w/ General

|                        |               |
|------------------------|---------------|
| Inspector: [Signature] | Date: 9-26-08 |
|------------------------|---------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **008-243**  
~~277~~

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                              |   |
|------------------------------|---|
| Project:<br><i>McDonalds</i> | Type of Inspection:<br><i>SD</i>            |
| Address:                     | Date Called:<br><i>9/22/08</i>              |
| Special Instructions:        | Date Wanted:<br><i>9/23/08</i> a.m.<br>p.m. |
|                              | Requester:<br><i>George</i>                 |
|                              | Phone No:                                   |

Approved per applicable codes.       Corrections required prior to approval.

COMMENTS:

*kw*

*SD* *9/23/08* *CB 2 set & complete 12" SD from CB 1. Continue 12" SD in direction of CB 3. OK to cover*

*9/23/08*

|                         |                         |
|-------------------------|-------------------------|
| Inspector:<br><i>WJ</i> | Date:<br><i>9/23/08</i> |
|-------------------------|-------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|

INSPECTION NO.

# INSPECTION RECORD

Retain a copy with permit

PERMIT NO. **051-243**

## CITY OF TUKWILA BUILDING DIVISION

6300 Southcenter Blvd., #100, Tukwila, WA 98188

(206)431-3670

|                              |   |
|------------------------------|---|
| Project:<br><b>McDonalds</b> | Type of Inspection:<br><b>SD</b>            |
| Address:<br><b>15210 T1B</b> | Date Called:<br><b>9/19/08</b>              |
| Special Instructions:        | Date Wanted:<br><b>9/19/08</b> a.m.<br>p.m. |
|                              | Requester:<br><b>George</b>                 |
|                              | Phone No:                                   |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

Handwritten: **SD**

**9/19/08 set CB# 1 & begin  
12" ADS NORTH TO CB# 2  
OK to cover**

|                          |                         |
|--------------------------|-------------------------|
| Inspector:<br><b>GAJ</b> | Date:<br><b>9/19/08</b> |
|--------------------------|-------------------------|

\$60.00 REINSPECTION FEE REQUIRED. Prior to inspection, fee must be paid at 6300 Southcenter Blvd., Suite 100. Call to schedule reinspection.

|              |       |
|--------------|-------|
| Receipt No.: | Date: |
|--------------|-------|



5

INSPECTION NUMBER

# INSPECTION RECORD

Retain a copy with permit

D08-243

PERMIT NUMBERS

## CITY OF TUKWILA FIRE DEPARTMENT

444 Andover Park East, Tukwila, Wa. 98188

206-575-4407

|                                       |                                     |
|---------------------------------------|-------------------------------------|
| Project: <i>McDonalds</i>             | Type of Inspection:<br><i>FINAL</i> |
| Address: <i>15210 TIB</i><br>Suite #: | Contact Person:<br><i>GEORGE</i>    |
| Special Instructions:                 | Phone No.:                          |

Approved per applicable codes.

Corrections required prior to approval.

**COMMENTS:**

*Fire Final - OK*

|                         |                 |
|-------------------------|-----------------|
| Needs Shift Inspection: | Sprinklers:     |
| Fire Alarm:             | Hood & Duct:    |
| Monitor:                | Pre-Fire:       |
| Permits:                | Occupancy Type: |

|                                   |                      |       |
|-----------------------------------|----------------------|-------|
| Inspector: <i>J. Waller / 512</i> | Date: <i>3/20/09</i> | Hrs.: |
|-----------------------------------|----------------------|-------|

**\$80.00 REINSPECTION FEE REQUIRED.** You will receive an invoice from the City of Tukwila Finance Department. Call to schedule a reinspection.

3

# INSPECTION RECORD

Retain a copy with permit

DOB-243  
08-F-4471

INSPECTION NUMBER

PERMIT NUMBERS

## CITY OF TUKWILA FIRE DEPARTMENT

444 Andover Park East, Tukwila, Wa. 98188

206-575-4407

|                                       |                                     |
|---------------------------------------|-------------------------------------|
| Project: <i>M<sup>e</sup> DONALDS</i> | Type of Inspection:<br><i>FINAL</i> |
| Address: <i>15210 TTB</i><br>Suite #: | Contact Person:                     |
| Special Instructions:                 | Phone No.:                          |

Approved per applicable codes.

Corrections required prior to approval.

**COMMENTS:**

*EMER LT FINAL - OK*

*FDC CORRECTION - OK*

*FIRE ALARM - FINAL - OK*

|                         |                 |
|-------------------------|-----------------|
| Needs Shift Inspection: | Sprinklers:     |
| Fire Alarm:             | Hood & Duct:    |
| Monitor:                | Pre-Fire:       |
| Permits:                | Occupancy Type: |

|                                   |                      |       |
|-----------------------------------|----------------------|-------|
| Inspector: <i>J. Walker / 512</i> | Date: <i>2/27/09</i> | Hrs.: |
|-----------------------------------|----------------------|-------|

**\$80.00 REINSPECTION FEE REQUIRED.** You will receive an invoice from the City of Tukwila Finance Department. Call to schedule a reinspection.

2

INSPECTION NUMBER

# INSPECTION RECORD

Retain a copy with permit

DOB-243  
OB-S-497  
OB-H-452  
OB-F-447

PERMIT NUMBERS  
MOB-131  
MOB-244

## CITY OF TUKWILA FIRE DEPARTMENT

444 Andover Park East, Tukwila, Wa. 98188

206-575-4407

|                                    |  |
|------------------------------------|--|
| Project: MC DONALD                 | Type of Inspection:<br>HOOD / FA / SPRINK / MECH |
| Address: 15210 Int. Bl<br>Suite #: | Contact Person:                                  |
| Special Instructions:              | Phone No.:                                       |

Approved per applicable codes.

Corrections required prior to approval.

**COMMENTS:** TCO - OK - PENDING BLDG APPROVAL

HOOD DUCT - FAN INTERLOCK - OK

TRIP TEST - OK

FA REPORTING - OK

FINAL - OK (MOB-244)

FA - Cd - OK Db - OK Pulls - OK

FINAL ADD STROBE ON CEILING BY DRIVE-THROUGH  
RAISE DEVICE BY REFRIGERATOR

MECH - FINAL - OK

DUCT DETECTORS - MOB-131

SPRINKLER FINAL - OK

EMER LT - ADD LT AT E. EXIT DOOR  
- AVG 1 FT / CD OK

|                         |                 |
|-------------------------|-----------------|
| Needs Shift Inspection: | Sprinklers:     |
| Fire Alarm:             | Hood & Duct:    |
| Monitor: FPI            | Pre-Fire:       |
| Permits:                | Occupancy Type: |

|                            |               |       |
|----------------------------|---------------|-------|
| Inspector: J. Waller / 512 | Date: 2/19/08 | Hrs.: |
|----------------------------|---------------|-------|

W/A

\$80.00 REINSPECTION FEE REQUIRED. You will receive an invoice from the City of Tukwila Finance Department. Call to schedule a reinspection.



1

# INSPECTION RECORD

Retain a copy with permit

D08-243  
08-5-497

INSPECTION NUMBER

PERMIT NUMBERS

## CITY OF TUKWILA FIRE DEPARTMENT

444 Andover Park East, Tukwila, Wa. 98188

206-575-4407

|                                       |   |
|---------------------------------------|---|
| Project: <i>McDONALDS</i>             | Type of Inspection:<br><i>SPRINKLER</i> |
| Address: <i>15210 TIB</i><br>Suite #: | Contact Person:                         |
| Special Instructions:                 | Phone No.:                              |

Approved per applicable codes.

Corrections required prior to approval.

### COMMENTS:

*HYDRO OK - START @ 210 @ 1230*  
*END @ 210 @ 1430*  
*OK TO COVER*

|                         |                 |
|-------------------------|-----------------|
| Needs Shift Inspection: | Sprinklers:     |
| Fire Alarm:             | Hood & Duct:    |
| Monitor:                | Pre-Fire:       |
| Permits:                | Occupancy Type: |

|                                 |                      |                |
|---------------------------------|----------------------|----------------|
| Inspector: <i>J. Walker/S12</i> | Date: <i>12/2/08</i> | Hrs.: <i>2</i> |
|---------------------------------|----------------------|----------------|

**\$80.00 REINSPECTION FEE REQUIRED.** You will receive an invoice from the City of Tukwila Finance Department. Call to schedule a reinspection.

# **Krazan & ASSOCIATES, INC.**

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING & INSPECTION

February 18, 2009

KA No. 066-08281  
Permit No. D08-243

RECEIVED

FEB 25 2009

COMMUNITY  
DEVELOPMENT

City of Tukwila  
Attn: Building Department  
6300 Southcenter Blvd.  
Tukwila, WA 98188

RE: Final Letter  
**McDonald's Tukwila**  
15210 Pacific Hwy W  
Tukwila, WA

To Whom It May Concern:

In accordance with your request and authorization, we have performed special testing and inspection services for the above referenced project. The special inspections for this project were:

- Reinforced Masonry
- Non-Destructive Examination - VT
- Grease Duct
- Reinforced Concrete
- Lateral Wood Framing

To the best of our knowledge, all work which has been tested and/or inspected has been found to be in general accordance with the approved plans and specifications, engineering revisions, and Chapter 17 of the 2006 International Building Code.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC:

McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.  
George Spectrum: [george@spectrumenterprises.us](mailto:george@spectrumenterprises.us)

**With Offices Serving The Western United States**

922 - Valley Avenue NW Suite 101 • Puyallup, WA 98371 • (253) 939-2500 • Fax: (253) 939-2556

February 17, 2009

RECEIVED

FEB 20 2009

DEVELOPMENT

KA No. 066-08281

Permit No. D08-243

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

**RE:** In Process Inspection Report  
**McDonald's Tukwila**  
Tukwila, WA

Dear Ms. Andrew,

Enclosed are copies of the compressive strength test results regarding the above referenced project.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.

# BACKFLOW PREVENTION ASSEMBLY TEST REPORT

ACCOUNT # \_\_\_\_\_

NAME OF PREMISE MCDONALDS Commercial  Residential

SERVICE ADDRESS 15210 PACIFIC HWY S CITY TUKWILA ZIP \_\_\_\_\_

CONTACT PERSON \_\_\_\_\_ PHONE ( ) \_\_\_\_\_ FAX ( ) \_\_\_\_\_

LOCATION OF ASSEMBLY IN FRONT OF BUILDING NEXT TO FIRE HYDRANT

DOWNSTREAM PROCESS IRRIGATION DCVA  RPBA  PVBA  OTHER \_\_\_\_\_

NEW INSTALLATION  EXISTING  REPLACEMENT  OLD ASSEMBLY SERIAL NUMBER \_\_\_\_\_

MAKE OF ASSEMBLY FEBLO MODEL 850 SERIAL NO. 112074C SIZE 1 1/2

| INITIAL TEST   | DCVA / RPBA<br>CHECK VALVE NO.1   | DCVA / RPBA<br>CHECK VALVE NO.2  | RPBA   | PVBA/SVBA<br>AIR INLET  |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
|--|---|--|--|---|--------------------------|--------------------------|-------|--------------------------|--------------------------|-------|--------------------------|--------------------------|-------|--------------------------|--------------------------|-------|---|-------|---------|------|--------------------------|--------------------------|-------|--------------------------|--------------------------|-------|--------------------------|--------------------------|-------|--------------------------|--------------------------|-------|---|-------|---------|------|--------------------------|--------------------------|-------|--------------------------|--------------------------|-------|--------------------------|--------------------------|-------|--------------------------|--------------------------|-------|---|
| PASSED <input checked="" type="checkbox"/><br>FAILED <input type="checkbox"/>            | LEAKED <input type="checkbox"/><br>CLOSED TIGHT <input checked="" type="checkbox"/><br><u>2.4</u> PSID  | LEAKED <input type="checkbox"/><br>CLOSED TIGHT <input checked="" type="checkbox"/><br><u>2.4</u> PSID | OPENED AT _____ PSID<br>#1 CHECK _____ PSID<br>AIR GAP OK? _____ | OPENED AT _____ PSID<br>DID NOT OPEN <input type="checkbox"/> |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| NEW PARTS AND REPAIRS  | <table style="width: 100%; border: none;"> <tr> <td>CLEAN</td><td>REPLACE</td><td>PART</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> </table> | CLEAN  | REPLACE  | PART  | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <table style="width: 100%; border: none;"> <tr> <td>CLEAN</td><td>REPLACE</td><td>PART</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> </table> | CLEAN | REPLACE | PART | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <table style="width: 100%; border: none;"> <tr> <td>CLEAN</td><td>REPLACE</td><td>PART</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td>_____</td></tr> </table> | CLEAN | REPLACE | PART | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <input type="checkbox"/> | <input type="checkbox"/> | _____ | <input type="checkbox"/> | <input type="checkbox"/> | _____ | CHECK VALVE<br>HELD AT _____ PSID<br>LEAKED <input type="checkbox"/><br>CLEANED <input type="checkbox"/><br>REPAIRED <input type="checkbox"/> |
| CLEAN  | REPLACE   | PART   |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| CLEAN  | REPLACE   | PART   |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| CLEAN  | REPLACE   | PART   |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| <input type="checkbox"/>   | <input type="checkbox"/>  | _____  |  |   |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |
| TEST AFTER REPAIRS<br>PASSED <input type="checkbox"/><br>FAILED <input type="checkbox"/> | CLOSED TIGHT <input type="checkbox"/><br>_____ PSID   | CLOSED TIGHT <input type="checkbox"/><br>_____ PSID  | OPENED AT _____ PSID<br>#1 CHECK _____ PSID                      | AIR INLET _____ PSID<br>CHK VALVE _____ PSID                  |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |       |         |      |                          |                          |       |                          |                          |       |                          |                          |       |                          |                          |       |   |

AIR GAP INSPECTION: Required minimum air gap separation provided? Yes  No  Detector Meter Reading \_\_\_\_\_

REMARKS: \_\_\_\_\_

LINE PRESSURE 55 PSI

TESTERS SIGNATURE: *Keith Lindsay* CERT. NO. B-3949 DATE \_\_\_\_\_

TESTERS NAME PRINTED: KEITH LINDSAY TESTERS PHONE # (253) 531-6000

REPAIRED BY: \_\_\_\_\_ DATE \_\_\_\_\_

FINAL TEST BY: \_\_\_\_\_ CERT. NO. \_\_\_\_\_ DATE \_\_\_\_\_

CALIBRATION DATE 2 15 109 GAUGE # 65432-29 MODEL # BFT6-5 MAKE: WILKENS

SERVICE RESTORED YES  NO

DATE: 12-8-08  
 PROJECT # 066-08251  
 PROJECT: McDONALDS - TUKWILA  
 LOCATION: 15210 PACIFIC HWY W.  
 KRAZAN PROJECT MANAGER: K.E.G.

CONTRACTOR: SPECTRUM CONSTRUCTION  
 PERMIT NO: D 08-243  
 INSPECTOR: G. NAILL  
 JURISDICTION: CITY of TUKWILA  
 WEATHER: CLOUDY TEMP: 44°F

**HIGH STRENGTH BOLTS**       **A325**       **A490**

A Skidmore test was performed on the 1 -inch  bolts with the following torque readings:  
54 <sup>KIPS</sup> lbs./ft.    61 <sup>KIPS</sup> lbs./ft.    58 <sup>KIPS</sup> lbs./ft.    \_\_\_\_\_ lbs./ft.    \_\_\_\_\_ lbs./ft.  
 Average torque reading: 57.6 <sup>KIPS</sup> lbs./ft. tension.

High strength bolt inspection was performed on the 1 -inch  bolts at the following locations: ROOF LEVEL  
E/3.9 E. FACE, E/3 EPW FACES, E/2 W. FACE, E/1.1 N. FACE, E/3.9 N. FACE, INTERMEDIATE ELEV. D/1.1  
W. FACE, D/3.9 E. FACE.

The bolts (DID) DID NOT meet the required 54 <sup>KIPS</sup> lbs./ft. tension.

**ANCHORS**       **Proof Load**       **Torque Test**       **Epoxy**

\_\_\_\_\_ % of \_\_\_\_\_ total \_\_\_\_\_ -inch  bolts were torque tested to \_\_\_\_\_ lbs./ft. tension at the following locations:

\_\_\_\_\_ % of \_\_\_\_\_ total \_\_\_\_\_ anchors were load tested to \_\_\_\_\_ lbs./ft. tension at the following locations:

Visual inspection was performed on \_\_\_\_\_

**NOTES**       **DISCREPANCIES**       **100% COMPLETE**

PERFORMED SKIDMORE QUALIFICATION TESTING OF 1" Ø A325 X 2 1/4" BOLTS LOT # K1131 SUPPLIED BY UNITECH. TESTING REVEALED THAT BOLT LOT EXCEEDED MINIMUM TENSION REQUIREMENT OF 54 KIPS AS DESCRIBED IN THE RSCC 2004.

VISUAL INSPECTION OF WELDED IN LINE OF BOLTED CONNECTIONS ROOF LEVEL E/1.1 W. FACE & E/2 E. FACE REVEALED WELDING TO BE COMPLETE AND VISUALLY ACCEPTABLE PER AWS D1.1-2006 AND ENGINEER TRANSMITTAL DATED 11-5-08.

THIS REPORT IS INTENDED TO AND DOES CLEAR PREVIOUSLY REPORTED NON-CONFORMING ITEMS.

To the best of my knowledge, the above (WAS) WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.  
 Superintendent/Representative: \_\_\_\_\_ Technician: \_\_\_\_\_

TUKWILA PUBLIC WORKS

| Contractor's Material and Test Certificate for Underground Piping  |  |
|--|--|
| <p><b>PROCEDURE</b><br/>                     Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.<br/>                     A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.</p> |  |
| <p>Property name <u>McDonalds Restaurant #440005</u> Date <u>02/24/09</u></p>  |  |
| <p>Property address <u>15210 Pacific Hwy - Tukwila WA 98188</u></p>  |  |
| Plans  | <p>Accepted by approving authorities (names) <u>Water District 125</u></p>   |
|  | <p>Address <u>3460 S. 148th St, Ste 110, Tukwila WA</u></p>  |
|  | <p>Installation conforms to accepted plans <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br/>                     Equipment used is approved <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br/>                     If no, state deviations</p>  |
| Instructions   | <p>Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br/>                     If no, explain</p>   |
|  | <p>Have copies of appropriate instructions and care and maintenance charts been left on premises? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br/>                     If no, explain</p>  |
| Location   | <p>Supplies buildings</p>  |
| Underground pipes and joints   | <p>Pipe types and class <u>4" 32 Ductile Iron Pipe</u> Type joint <u>Field Lock Tightened</u></p>  |
|  | <p>Pipe conforms to _____ standard <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br/>                     Fittings conform to _____ standard <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br/>                     If no, explain</p>   |
|  | <p>Joints needing any _____, clamped, strapped, or blocked in accordance with <u>Water District 125 standard</u> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br/>                     If no, explain <u>Tukwila Fire District</u></p>  |
| Test description   | <p><b>Flushing:</b> Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 gpm (1476 L/min) for 4 in. pipe, 880 gpm (3331 L/min) for 6 in. pipe, 1560 gpm (5903 L/min) for 8 in. pipe, 2440 gpm (9239 L/min) for 10 in. pipe, and 3520 gpm (13,323 L/min) for 12 in. pipe. When supply cannot produce stipulated flow rates, obtain maximum available.<br/> <b>Hydrostatic:</b> All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.4 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure ± 5 psi for 2 hours.<br/> <b>Hydrostatic Testing Allowance:</b> Where additional water is added to the system to maintain the test pressures required by 10.10.2.2.1, the amount of water shall be measured and shall not exceed the limits of the following equation (For metric equation, see 10.10.2.2.4):</p> $L = \frac{SDVP}{148,000}$ <p>L = testing allowance (makeup water), in gallons per hour<br/>                     S = length of pipe tested, in feet<br/>                     D = nominal diameter of the pipe, in inches<br/>                     P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)</p> |
| Flushing tests   | <p>New underground piping flushed according to <u>Tukwila</u> standard by (company) <u>Water district 125</u> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br/>                     If no, explain</p>  |
|  | <p>How flushing flow was obtained <input checked="" type="checkbox"/> Public water <input type="checkbox"/> Tank or reservoir <input type="checkbox"/> Fire pump Through what type opening <input checked="" type="checkbox"/> Hydrant butt <input type="checkbox"/> Open pipe</p>   |
|  | <p>Lead-ins flushed according to <u>Tukwila</u> standard by (company) <u>EN</u> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br/>                     If no, explain</p>  |
|  | <p>How flushing flow was obtained <input checked="" type="checkbox"/> Public water <input type="checkbox"/> Tank or reservoir <input type="checkbox"/> Fire pump Through what type opening <input checked="" type="checkbox"/> Y connection to flange and spigot <input type="checkbox"/> Open pipe</p>  |

FIGURE 10.10.1 Sample of Contractor's Material and Test Certificate for Underground Piping.


|                                    |   |               |  |
|------------------------------------|---|---------------|--|
| Hydrostatic test                   | All new underground piping hydrostatically tested at <u>250</u> psi for <u>2</u> hours  |               | Joints covered<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No  |
| Leakage test                       | Total amount of leakage measured<br><u>0</u> gallons <u>0</u> hours   |               |  |
| Leakage test                       | Allowable leakage<br><u>n/a</u> gallons _____ hours   |               |  |
| Hydrants                           | Number installed<br><u>0</u>  | Type and make | All operate satisfactorily<br><input type="checkbox"/> Yes <input type="checkbox"/> No |
| Control valves                     | Water control valves left wide open if no, state reason   |               | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No                    |
| Control valves                     | Hose threads of fire department connections and hydrants interchangeable with those of fire department answering alarm                                    |               | <input type="checkbox"/> Yes <input type="checkbox"/> No                               |
| Remarks                            | Date left in service<br><u>Installed per Tukwila FO Specs</u>   |               |  |
| Name of installing contractor      | <u>Earthworks Northwest Inc.</u>  |               |  |
| Signatures                         | Tests witnessed by  |               |  |
| For property owner (signed)        | Title   | Date          |  |
| For installing contractor (signed) | Title   | Date          |  |
| Additional explanation and notes   | <p><u>President, Earthworks Northwest Inc</u> <u>02/24/2009</u></p>  |               |  |

FIGURE 10.10.1 Continued

Project No. 066-08281 Cyl. Code 91000 Pour Date 1/5/2009 Report No. 6651  
 Weather Overcast Jurisdiction City of Tukwila Permit No. D08-243  
 Project McDonald's Tukwila Engineer 0  
 Location 15210 Pacific Hwy W Tukwila Architect 0  
 Client McDonald's Corporation Contractor Spectrum Construction

| Field Data |                    | MORTAR/GROUT REPORT |  |          |       |       |         |
|------------|--------------------|---------------------|--|----------|-------|-------|---------|
| Supplier   | Cascade Mobile Mix | Plant No.           |  | Site Mix | Yes   |       | Initial |
|            |                    |                     |  |          |       |       | Max/Min |
|            |                    |                     |  | Flow or  | Grout | Air   | Temp.   |
|            |                    |                     |  | Slump    | Temp. | Temp. | (F)     |
| Time       | Truck#             | Ticket #            | % Air                                  | (in.)    | (F)   | (F)   | (F)     |
| 11:15am    |                    |                     |  | 8        | 44    | 43    |         |
|            |                    |                     | Grout Box Used                         | yes      |       |       |         |
|            |                    |                     | Number of units used to form specimens | 4        |       |       |         |

| Reported Batch Data        |                |                |
|----------------------------|----------------|----------------|
|                            | Design Weights | Actual Weights |
| Mix No.                    | unavailable    |                |
| Cem. lbs.                  | will fax to    |                |
| F. Ash lbs.                | contractors    |                |
| C. agg. lbs. 1             | office         |                |
| C. agg. lbs. 2             |                |                |
| C. agg. lbs. 3             |                |                |
| Sand lbs.                  |                |                |
| Water lbs.                 |                |                |
| Air Ent. (oz)              |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Water Added on Job (gals.) |                |                |

| Placement Area |  |
|----------------|--|
| Location       | Trash enclosure perimeter walls elevation 4' to 8' (top out) sample obtain at the southeast corner   |
| Remarks        | Cascade mobile concrete mix truck, mix deposited into cascade pump truck & walls filled solid and consolidated. Please refer to Field Report No. 89606 |

| Field Test Methods |            |           |
|--------------------|------------|-----------|
| x                  | ASTM C143  | ASTM C138 |
| x                  | ASTM C1064 | ASTM C173 |
| x                  | ASTM C31   | Other     |

Inspector J. Bland

| Laboratory Data |           |     | Design Strength 2,000 @ 28 days |             |                  |                            |                 | Date Specimens Rec'd. |       |           | Laboratory Test Methods |   |            |
|-----------------|-----------|-----|---------------------------------|-------------|------------------|----------------------------|-----------------|-----------------------|-------|-----------|-------------------------|---|------------|
| Cyl. Code       | Test Date | Age | Mid Pt. Width (in)              | Height (in) | Out of Plumb (%) | Cross Section Area (sq.in) | Max. Load (lbs) | Comp. Strength (psi)  | Set # | Tested By | Break Type              |   |            |
| 91000-1         | 1/12/2009 | 7   | 3.328                           |             |                  | 11.08                      | 46675           | 4,210                 | 1     | DH        | 4                       |   |            |
| 91000-2         | 2/2/2009  | 28  | 3.346                           |             |                  | 11.68                      | 61320           | 5,250                 | 1     | DH        | 1                       | X | ASTM C617  |
| 91000-3         | 2/2/2009  | 28  | 3.492                           |             |                  | 11.50                      | 64935           | 5,650                 | 1     | DH        | 2                       | X | ASTM C1019 |
| 91000-4         | 2/2/2009  | 28  | 3.388                           |             |                  | 11.52                      | 61665           | 5,350                 | 1     | DH        | 2                       |   | ASTM C1231 |
|                 |           |     | 3.396                           |             |                  |                            |                 |                       |       |           |                         |   |            |
|                 |           |     | 3.398                           |             |                  |                            |                 |                       |       |           |                         |   |            |
|                 |           |     | 3.393                           |             |                  |                            |                 |                       |       |           |                         |   |            |

Remarks

Results Reviewed By *KEG*

Date Reviewed

|                |
|----------------|
| Test Results   |
| X Conforming   |
| Non-Conforming |

Codes for Break Types: 1: Cone 2: Cone &amp; Split 3: Cone &amp; Shear 4: Shear 5: Columnar (Split)

Measurement Uncertainties: ASTM C109= +/- 10.7, ASTM C1019= +/- 14.4%

Form 04103

Revision 0

Effective Date 12/02/02

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SHANE YOUNG  
Office Manager

MARK PARSONS  
Superintendent

## *Water District No. 125, King County*

Telephone: (206) 242-9547  
FAX: (206) 248-1744

P.O. Box 68147, Riverton Hts. Br.

Office: 3460 S. 148th St. Ste. 110

**TUKWILA, WASHINGTON 98168**

February 2<sup>nd</sup>, 2009

Spectrum Enterprises  
9840 48<sup>th</sup> Ave S  
Tacoma, WA 98446

Re: 15210 Tukwila International Blvd

To Whom It May Concern:

Spectrum Enterprises has met Water District No. 125 standards for their four inch fire system in the following areas:

Pressure test  
Flushing  
Purity Samples

If you have any questions or comments I can be reached at (206) 242-9547.

Sincerely,

*Mark Parsons*

Mark Parsons  
Superintendent  
Water District No. 125

January 20, 2009

**RECEIVED**

KA No. 066-08281  
Permit No. D08-243

JAN 20 2009

COMMUNITY  
DEVELOPMENT

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

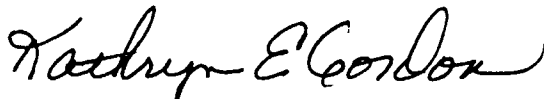
**RE:** In Process Inspection Report  
**McDonald's Tukwila**  
Tukwila, WA

Dear Ms. Andrew,

Enclosed are copies of the compressive strength test results regarding the above referenced project.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Christopher Doerschlag  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.

Project No. 066-08281 Cyl. Code 81970 Pour Date 12/11/2008 Report No. 6652  
 Weather Overcast Jurisdiction City of Tukwila Permit No. D08-243  
 Project McDonald's Tukwila Engineer 0  
 Location 15210 Pacific Hwy W Tukwila Architect 0  
 Client McDonald's Corporation Contractor Spectrum Construction

| Field Data |                  | MORTAR/GROUT REPORT |       |  |       |         |         |
|------------|------------------|---------------------|-------|--|-------|---------|---------|
| Supplier   | Mutual Materials | Plant No.           |       | Site Mix                               | Yes   | Initial |         |
|            |                  |                     |       | Flow or                                | Grout | Air     | Max/Min |
|            |                  |                     |       | Slump                                  | Temp. | Temp.   | Temp.   |
| Time       | Truck#           | Ticket #            | % Air | (in.)                                  | (F)   | (F)     | (F)     |
| 8:00am     |                  |                     |       | Flow                                   | 47    | 43      | #       |
|            |                  |                     |       | Grout Box Used                         | Yes   |         |         |
|            |                  |                     |       | Number of units used to form specimens | 4     |         |         |

| Reported Batch Data                  |                |                |
|--------------------------------------|----------------|----------------|
|                                      | Design Weights | Actual Weights |
| Mix No.                              | Mutual Concr   |                |
| Cem. lbs.                            | 60lbs Sacks    |                |
| F. Ash lbs.                          | Pea Gravel     |                |
| C. agg. lbs. 1                       |                |                |
| C. agg. lbs. 2                       |                |                |
| C. agg. lbs. 3                       |                |                |
| Sand lbs.                            |                |                |
| Water lbs.                           |                |                |
| Air Ent. (oz)                        |                |                |
| Other (oz)                           |                |                |
| Other (oz)                           |                |                |
| Other (oz)                           |                |                |
| Other (oz)                           |                |                |
| Water Added on Job (gals.) As needed |                |                |

**Placement Area**  
 Location Trash enclosure perimeter walls from finish floor to 4'

**Remarks** Mutual 60lb sacks of concrete mix was used in lieu of grout mix, mechanical paddle wheel mixer used w/water added for flowable consistency. Placed by bucket, consolidated w/ H/F Vibration.

| Field Test Methods |           |
|--------------------|-----------|
| ASTM C143          | ASTM C138 |
| x ASTM C1064       | ASTM C173 |
| x ASTM C31         | Other     |

Inspector J. Bland

| Laboratory Data |            | Design Strength not specified @ 28 days |                    |             |                  | Date Specimens Rec'd.      |                 |                      | Laboratory Test Methods |          |      |              |
|-----------------|------------|---|--------------------|-------------|------------------|----------------------------|-----------------|----------------------|-------------------------|----------|------|--------------|
| Cyl. Code       | Test Date  | Age                                     | Mid Pt. Width (in) | Height (in) | Out of Plumb (%) | Cross Section Area (sq.in) | Max. Load (lbs) | Comp. Strength (psi) | Tested Set #            | Break By | Type |              |
| 81970-1         | 12/18/2009 | 7                                       | 3.383              |             |                  | 11.25                      | 23725           | 2,110                | 1                       | DH       |      | X ASTM C39   |
| 81970-2         | 1/8/2009   | 28                                      | 3.236              |             |                  | 11.13                      | 38185           | 3,430                | 1                       | RW       | 2    | ASTM C109    |
| 81970-3         | 1/8/2009   | 28                                      | 3.362              |             |                  | 11.23                      | 37535           | 3,340                | 1                       | Rw       | 2    | ASTM C617    |
| 81970-4         |            | H                                       | 3.310              |             |                  | 10.76                      | 42400           | 3,940                | 1                       | RW       | 4    | ASTM C1019   |
|                 |            |   | 3.316              |             |                  |                            |                 |                      |                         |          |      | X ASTM C1231 |
|                 |            |   | 3.386              |             |                  |                            |                 |                      |                         |          |      |              |
|                 |            |   | 3.252              |             |                  |                            |                 |                      |                         |          |      |              |

**Remarks**  
 Results Reviewed By *MEG*

Date Reviewed

Test Results  
 Conforming  
 Non-Conforming

**Codes for Break Types:** 1: Cone 2: Cone & Split 3: Cone & Shear 4: Shear 5: Columnar (Split)  
**Measurement Uncertainties:** ASTM C109= +/- 10.7. ASTM C1019= +/- 14.4%

Project No. 066-08281      Cyl. Code 91000      Pour Date 1/5/2009      Report No. 6651  
 Weather Overcast      Jurisdiction City of Tukwila      Permit No. D08-243  
 Project McDonald's Tukwila      Engineer 0  
 Location 15210 Pacific Hwy W Tukwila      Architect 0  
 Client McDonald's Corporation      Contractor Spectrum Construction

| Field Data |                    | MORTAR/GROUT REPORT |  |               |             |           |         |
|------------|--------------------|---------------------|--|---------------|-------------|-----------|---------|
| Supplier   | Cascade Mobile Mix | Plant No.           |  | Site Mix      | Yes         |           | Initial |
|            |                    |                     |  |               |             |           | Max/Min |
|            |                    |                     |  | Flow or Slump | Grout Temp. | Air Temp. | Temp.   |
| Time       | Truck#             | Ticket #            | % Air                                  | (in.)         | (F)         | (F)       | (F)     |
| 11:15am    |                    |                     |  | 8             | 44          | 43        |         |
|            |                    |                     | Grout Box Used                         | yes           |             |           |         |
|            |                    |                     | Number of units used to form specimens | 4             |             |           |         |

| Reported Batch Data        |                |                |
|----------------------------|----------------|----------------|
|                            | Design Weights | Actual Weights |
| Mix No.                    | unavailable    |                |
| Cem. lbs.                  | will fax to    |                |
| F. Ash lbs.                | contractors    |                |
| C. agg. lbs. 1             | office         |                |
| C. agg. lbs. 2             |                |                |
| C. agg. lbs. 3             |                |                |
| Sand lbs.                  |                |                |
| Water lbs.                 |                |                |
| Air Ent. (oz)              |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Water Added on Job (gals.) |                |                |

**Placement Area**  
 Location Trash enclosure perimeter walls elevation 4' to 8' (top out) sample obtain at the southeast corner

**Remarks** Cascade mobile concrete mix truck, mix deposited into cascade pump truck & walls filled solid and consolidated. Please refer to Field Report No. 89606

| Field Test Methods |            |           |
|--------------------|------------|-----------|
| x                  | ASTM C143  | ASTM C138 |
| x                  | ASTM C1064 | ASTM C173 |
| x                  | ASTM C31   | Other     |

Inspector J. Bland

| Laboratory Data |           |     | Design Strength 2,000 @ 28 days |             |                  |                            |                 | Date Specimens Rec'd. |       |           | Laboratory Test Methods |              |  |
|-----------------|-----------|-----|---------------------------------|-------------|------------------|----------------------------|-----------------|-----------------------|-------|-----------|-------------------------|--------------|--|
| Cyl. Code       | Test Date | Age | Mid Pt. Width (in)              | Height (in) | Out of Plumb (%) | Cross Section Area (sq.in) | Max. Load (lbs) | Comp. Strength (psi)  | Set # | Tested By | Break Type              |              |  |
| 91000-1         | 1/12/2009 | 7   | 3.328<br>3.332                  |             |                  | 11.08                      | 46675           | 4,210                 | 1     | DH        | 4                       | ASTM C39     |  |
| 91000-2         | 2/2/2009  | 28  |                                 |             |                  |                            |                 |                       | 1     |           |                         | X ASTM C109  |  |
| 91000-3         | 2/2/2009  | 28  |                                 |             |                  |                            |                 |                       | 1     |           |                         | X ASTM C617  |  |
| 91000-4         |           | H   |                                 |             |                  |                            |                 |                       | 1     |           |                         | X ASTM C1019 |  |
|                 |           |     |                                 |             |                  |                            |                 |                       |       |           |                         | ASTM C1231   |  |

Remarks

Results Reviewed By *ASG*

Date Reviewed

|                |
|----------------|
| Test Results   |
| Conforming     |
| Non-Conforming |

Codes for Break Types: 1: Cone 2: Cone & Split 3: Cone & Shear 4: Shear 5: Columnar (Split)

Measurement Uncertainties: ASTM C109= +/- 10.7, ASTM C1019= +/- 14.4%

GEOTECHNICAL ENGINEERING ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING & INSPECTION

January 14, 2009

RECEIVED  
JAN 21 2009  
DEVELOPMENT  
COMMUNITY

KA No. 066-08281  
Permit No. D08-243

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

**RE: Special Inspection**  
**McDonald's Tukwila**  
Tukwila, WA


Dear Ms. Andrew,

In accordance with your request and authorization, our firm performed special inspections for the above-referenced project. The inspections were performed by our inspectors from January 5 through January 7, 2009. Copies of our inspector's field reports are attached.

Unless otherwise indicated, the structural activities noted on the attached daily field reports were in accordance with the approved project plans and specifications. A guarantee that the contractor has necessarily constructed the structure in full accord with the plans and specifications is neither intended nor implied.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**

  
Kathy E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Christopher Doerschlag  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.

**Offices Serving The Western United States**

DATE: 1-05-08  
PROJECT #: 066-08281  
PROJECT: MCDONALD'S TURKULA  
LOCATION: 15210 PACIFIC HWY W  
KRAZAN PROJECT MANAGER: KEG

CONTRACTOR: SPECTRUM CONSTRUCTION  
JURISDICTION: CITY OF TURKULA WA.  
PERMIT #: DOB-243  
INSPECTOR: JAMES BLAND  
WEATHER: OVERCAST TEMP: 48°

INSPECTOR ON SITE AS SCHEDULED BY THE CONTRACTOR  
FOR SPECIAL INSPECTION OF REINFORCED MASONRY AND  
GROUT PLACEMENT OBSERVATIONS.

"TRASH ENCLOSURE PERIMETER WALLS" 8" CMU

REVIEWED THE APPROVED PLANS & SPECIFICATIONS "1/507

VERIFIED VERTICAL #5 REBAR AT 16" OC, N/A #5 AT ENDS OF WALLS & CORNERS  
HORIZONTALS (2) @ 48" OC & (2) AT TOP OF WALL (#5 REBAR)  
W/ MATCHING CORNER BARS, CHECKED LAP SPICES, CLEARANCE, CELLS WERE  
CLEAN & DRY (COVERED W/ PLASTIC), GRADE 60  
ELEVATION: 4'-0 TO 8'-0 (TOP OUT)

RE-STEEL INSTALLATION COMPLETE PER PLANS

MASONRY CONTRACTOR USED CONCRETE IN-STEAD OF GROUT, CONCRETE  
WAS SITE MIXED BY CASCADE MOBILE MIX TRUCK (VERIFIED AGG. SIZE  
PER GRAVEL 3/8", MIXED CONCRETE WAS DEPOSITED INTO A CASCADE  
LINE PUMP TRUCK THEN PUMPED INTO ALL CELLS OF MASONRY UNITS  
(SOLID GROUTED) EACH CELL WAS CONSOLIDATED BY 1/4" MECHANICAL  
VIBRATION, CAST (1) GROUT BOX (4 SAMPLES) FOR COMPRESSIVE STRENGTH  
TESTING SEE IAG REPORT # 06651 FOR RESULTS

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician:

*James Bland*

Serving the Western United States

DATE: 1/7/2009  
PROJECT #: 066-08281  
PROJECT: McDonald's Tukwila  
LOCATION: 15210 Pacific Hwy W.  
KRAZAN PROJECT MANAGER: K.E.C.

CONTRACTOR: Spectrum  
JURISDICTION: Tukwila, WA.  
PERMIT #: 008-241  
INSPECTOR: Steve Taylor dr.  
WEATHER: Rain TEMP: 48°F

Inspector on site as requested by the contractor to perform special inspection of Grease Duct seam welds. Visual checked each field seam weld from Hood to Roof vent, Four grease ducts total were inspected and found completed per 1MS 506.3.3.1

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS / WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician: Steve Taylor

Serving the Western United States

December 16, 2008

**RECEIVED**

KA No. 066-08281  
Permit No. D08-243

**DEC 23 2008**

**COMMUNITY  
DEVELOPMENT**

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

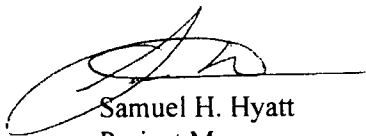
**RE:** In Process Inspection Report  
**McDonald's Tukwila**  
Tukwila, WA

Dear Ms. Andrew,

Enclosed are copies of the compressive strength test results regarding the above referenced project.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Samuel H. Hyatt  
Project Manager  
Puyallup Division

CC: City of Tukwila  
McDonald's Corporation, Attn: Julie Andrew, [julie.andrews@us.mcd.com](mailto:julie.andrews@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Christopher Doerschlag  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.



Project No. 066-08281 Cyl. Code 1849 Pour Date 11/10/2008 Report No. 40716  
 Weather overcast/windy Jurisdiction City of Tukwila Permit No. D06-243  
 Project McDonald's Tukwila Engineer 0  
 Location 15210 Pacific Hwy W Tukwila Architect 0  
 Client McDonald's Corporation Contractor Spectrum International.

| Field Data |        | CYLINDER REPORT |       |          |       |      |
|------------|--------|-----------------|-------|----------|-------|------|
| Concrete   | X      | Other           |       |          |       |      |
| Supplier   | Miles  | Plant No.       | 201   | Site Mix |       |      |
|            |        |                 |       | Mix      | Air   | Unit |
|            |        |                 | Slump | Temp.    | Temp. | Wt.  |
| Time       | Truck# | Ticket #        | % Air | (in.)    | (F)   | (F)  |
| 10:15      | m134   | 216547          | 6.1   | 5        | 70    | 55   |

| Reported Batch Data        |                |                |
|----------------------------|----------------|----------------|
|                            | Design Weights | Actual Weights |
| Mix No.                    | 04c4af         | 04c4af         |
| Cem. lbs.                  | 470            | 470            |
| F. Ash lbs.                | 94             | 93.6           |
| C. agg. lbs. 1             | 1860           | 1851           |
| C. agg. lbs. 2             |                |                |
| C. agg. lbs. 3             |                |                |
| Sand lbs.                  | 1230           | 1289           |
| Water lbs.                 | 246            | 227            |
| Air Ent. (oz)              | 7              | 7              |
| Other (oz)                 | 33.8           | 33.8           |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Water Added on Job (gals.) |                | 5              |

Placement Area  
 Location Trash enclosure - S.O.G.- 5" thick (at east side) 25' x 20' x 5"  
  
 Remarks Concrete placed by tailgatin, consolidated by puddling

| Field Test Methods |           |
|--------------------|-----------|
| x ASTM C143        | ASTM C138 |
| x ASTM C1064       | ASTM C173 |
| x ASTM C31         | ASTM C172 |
| OTHER              | ASTM C231 |

Inspector

| Laboratory Data |            |            | Design Strength 3,500 @ 28 days |       |       |      | Date Specimens Rec'd. |                  |       |           | Laboratory Test Methods |              |
|-----------------|------------|------------|---------------------------------|-------|-------|------|-----------------------|------------------|-------|-----------|-------------------------|--------------|
| Cyl. Code       | Test Date  | Field Cure | Age                             | Dim.  | Area  | C.F. | Max. Load             | Comp. Str. (psi) | Set # | Tested By |                         | Break Type   |
| 1849-1          | 11/17/2008 |            | 7                               | 4.01  | 12.62 |      | 48840                 | 3,870            | 1     | DH        | 3                       | X ASTM C39   |
| 1849-2          | 12/8/2008  |            | 28                              | 4.011 | 12.63 |      | 61110                 | 4,840            | 1     | DH        | 3                       | ASTM C109    |
| 1849-3          | 12/8/2008  |            | 28                              | 4.011 | 12.63 |      | 62405                 | 4,940            | 1     | DH        | 2                       | ASTM C617    |
| 1849-4          |            |            | H                               |       |       |      |                       |                  | 1     |           |                         | X ASTM C1231 |
| 1849-5          |            |            |                                 |       |       |      |                       |                  |       |           |                         | ASTM C780    |
| 1849-6          |            |            |                                 |       |       |      |                       |                  |       |           |                         | Other        |
| 1849-7          |            |            |                                 |       |       |      |                       |                  |       |           |                         |              |
| 1849-7          |            |            |                                 |       |       |      |                       |                  |       |           |                         |              |

Remarks samples in cure box-east side  
 Results Reviewed By *[Signature]* Date Reviewed 12-17

|                |
|----------------|
| Test Results   |
| X Conforming   |
| Non-Conforming |

Codes for Break Types: 1: Cone 2: Cone & Split 3: Cone & Shear 4: Shear 5: Columnar (Split)

Measurement Uncertainties: ASTM C-39 +/- 8%

 **Krazan** & ASSOCIATES, INC.

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GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING & INSPECTION

December 15, 2008

**RECEIVED**

**DEC 23 2008**

**QUALITY  
DEVELOPMENT**

KA No. 066-08281  
Permit No. D08-243

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

**RE: Special Inspection  
McDonald's Tukwila  
Tukwila, WA**

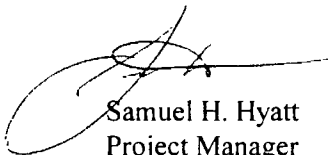
Dear Ms. Andrew,

In accordance with your request and authorization, our firm performed special inspections for the above-referenced project. The inspections were performed by our inspectors from December 8 through December 11, 2008. Copies of our inspector's field reports are attached.

Unless otherwise indicated, the structural activities noted on the attached daily field reports were in accordance with the approved project plans and specifications. A guarantee that the contractor has necessarily constructed the structure in full accord with the plans and specifications is neither intended nor implied.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Samuel H. Hyatt  
Project Manager  
Puyallup Division

CC: City of Tukwila  
McDonald's Corporation, Attn: Julie Andrew, [julie.andrews@us.mcd.com](mailto:julie.andrews@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Christopher Doerschlag  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.

**Offices Serving The Western United States**

DATE: 12-8-08  
PROJECT #: 066-08251  
PROJECT: MCDONALDS TUKWILA  
LOCATION: 15210 PACIFIC HWY W.  
KRAZAN PROJECT MANAGER: K.E.G.

CONTRACTOR: SPECTRUM CONSTRUCTION  
PERMIT NO: D 08-243  
INSPECTOR: G. HILL  
JURISDICTION: CITY OF TUKWILA  
WEATHER: CLOUDY TEMP: 44°F

**HIGH STRENGTH BOLTS**       **A325**       **A490**

A Skidmore test was performed on the 1-inch bolts with the following torque readings:  
51 KIPS lbs./ft.    61 KIPS lbs./ft.    58 KIPS lbs./ft.    \_\_\_\_\_ lbs./ft.    \_\_\_\_\_ lbs./ft.  
Average torque reading: 57.6 KIPS lbs./ft. tension.

High strength bolt inspection was performed on the 1-inch bolts at the following locations: ROOF LEVEL  
E/3.9 E-FACE, E/3 EPW FACES, E/2 W-FACE, E/1.1 N-FACE, E/3.9 N-FACE, INTERMEDIATE ELEV. D/1.1 W-FACE, D/3.9 E-FACE.  
 The bolts DID NOT meet the required 54 KIPS lbs./ft. tension.

**ANCHORS**       **Proof Load**       **Torque Test**       **Epoxy**

\_\_\_\_\_ % of \_\_\_\_\_ total \_\_\_\_\_ -inch bolts were torque tested to \_\_\_\_\_ lbs./ft. tension at the following locations:  
\_\_\_\_\_  
 \_\_\_\_\_ % of \_\_\_\_\_ total \_\_\_\_\_ anchors were load tested to \_\_\_\_\_ lbs./ft. tension at the following locations:  
\_\_\_\_\_  
 Visual inspection was performed on \_\_\_\_\_

**NOTES**       **DISCREPANCIES**       **% COMPLETE**

PERFORMED SKIDMORE QUALIFICATION TESTING OF 1" Ø A325 X 2 1/4" BOLTS LOT # KX131  
SUPPLIED BY UNITESIL. TESTING REVEALED THAT 13% LOT EXCEEDED MINIMUM  
TENSION REQUIREMENT OF 54 KIPS AS DESCRIBED IN THE RCSG 2004.

VISUAL INSPECTION OF WELDED IN LINE OF BOLTED CONNECTIONS ROOF LEVEL E/1.1 W-FACE & E/2 E-FACE REVEALED WELDING TO BE COMPLETE AND VISUALLY ACCEPTABLE PER AWS D11.2:200 AND ENGINEER TRANSMITTAL DATED 11-5-08.

THIS REPORT IS INTENDED TO AND DOES CLEAR PREVIOUSLY REQUESTED NON-CONFORMANCE ITEMS.

To the best of my knowledge, the above WAS / WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.  
Superintendent/Representative: \_\_\_\_\_ Technician: \_\_\_\_\_

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING AND INSPECTION

DATE: 12-11-08  
PROJECT #: 066-08281  
PROJECT: MCDONALD'S TURKULA  
LOCATION: 15210 PACIFIC HWY W  
KRAZAN PROJECT MANAGER: KEG

CONTRACTOR: SPECTRUM CONST,  
JURISDICTION: TURKULA WA,  
PERMIT #: D08243  
INSPECTOR: JAMES BLAND  
WEATHER: OVERCAST TEMP: \_\_\_\_\_

INSPECTOR ON SITE AS SCHEDULED BY THE CONTRACTOR FOR STRUCTURAL MASONRY AND GROUT PLACEMENT OBSERVATIONS.

① REVIEWED THE APPROVED PLANS 11/SD7 ON THE TRASH ENCLOSURE WALLS,

② INSPECTED THE 8" CMU WALLS FROM FINISH FLOOR TO 4'-0 (4' LIFT)  
VERIFIED (1) #5 VERTICAL AT 16" OC, (2) #5 AT JAMBS, END OF WALLS.  
HORIZONTAL - (2) #5 IN THE BOTTOM COURSE @ 48" OC W/MATCHING CORNER BARS, 40 DIAMETER LAP SPICE (25"), CELLS ARE CLEAN & DRY

MASONRY CONTRACTOR IS USING MUTUALS CONCRETE MIX IN- LIEU OF GROUT MIX, 60 LB SACKS IS MIXED W/MECHANICAL MIXER W/WATER ADDED TO OBTAIN FLOWABLE CONSISTENCY, EACH REINFORCED CELL WAS CONSOLIDATED W/ 11/2 VIBRATION. CAST (1) GROUT BOX FULL OF THE CONCRETE MIX FOR COMPRESSIVE STRENGTH TESTING, SEE OMB REPORT # 06652, BUCKETS USED FOR DEPOSITING MIX.

NO SPECIAL INSPECTION WERE NOTED ON PLANS FOR MASONRY, OR THE COMPRESSIVE STRENGTH REQUIREMENTS.

CONTRACTOR TO REQUEST APPROVAL FROM ENGINEER ON CONCRETE IN- LIEU OF GROUT

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS / WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:


Technician:

James Bland

Serving the Western United States

This field report indicates our inspector's observation and testing results based on the site condition and contractor's activities. This information is subject to review prior to final submittal. By signing this report, our inspector does not accept responsibility for validity of results. Some information on this report has been provided by others on site.

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# Krazan & ASSOCIATES, INC.

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GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING & INSPECTION

December 8, 2008

KA No. 066-08140  
Permit No. D08-161  
Permit No. D08-316

City of Tukwila  
Attn: Building Department  
6300 Southcenter Blvd.  
Tukwila, WA 98188

**RE:** Final Letter  
**Fidelity Investments**  
304 Strander Blvd.  
Tukwila, WA

To Whom It May Concern:

In accordance with your request and authorization, we have performed special testing and inspection services for the above referenced project. The special inspections for this project were:

- Reinforced Concrete
- Non-Destructive Examination - VT
- Reinforcing Masonry
- Structural Steel

To the best of our knowledge, all work which has been tested and/or inspected has been found to be in general accordance with the approved plans and specifications, engineering revisions, and Chapter 17 of the 2006 International Building Code.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: Westfield Corp, Inc.  
LeMessurier Consultants Attn: Peter Cheever, Engineer pcheever@lemessurier.com

---

**With Offices Serving The Western United States**

922 - Valley Avenue NW Suite 101 • Puyallup, WA 98371 • (253) 939-2500 • Fax: (253) 939-2556

# Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING & INSPECTION

December 8, 2008

**RECEIVED**

**DEC 15 2008**

**COMMUNITY  
DEVELOPMENT**

KA No. 066-08281  
Permit No. D08-243

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

**RE:** Special Inspection  
**McDonald's Tukwila**  
Tukwila, WA

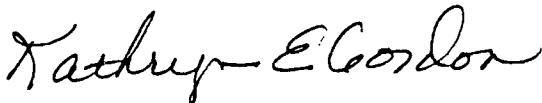
Dear Ms. Andrew,

In accordance with your request and authorization, our firm performed special inspections for the above-referenced project. The inspections were performed by our inspectors on December 3, 2008. Copies of our inspector's field reports are attached.

Unless otherwise indicated, the structural activities noted on the attached daily field reports were in accordance with the approved project plans and specifications. A guarantee that the contractor has necessarily constructed the structure in full accord with the plans and specifications is neither intended nor implied.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila  
McDonald's Corporation, Attn: Julie Andrew, [julie.andrews@us.mcd.com](mailto:julie.andrews@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Christopher Doerschlag  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.

**Offices Serving The Western United States**

DATE: 12-03-08 CONTRACTOR: SPECTRUM ENTERPRISES LLC.  
PROJECT #: 066-08281 PERMIT NO: B08-243  
PROJECT: McDONALD'S TUKWILA INSPECTOR: JONATHAN PINK  
LOCATION: 15210 TUKWILA INTERNATIONAL BLVD. JURISDICTION: CITY OF TUKWILA  
KRAZAN PROJECT MANAGER: KEG WEATHER: PARTLY CLOUDY TEMP: 45°F to 52°F

**SPECIAL INSPECTION OF LATERAL FRAMING.**

On site as requested by the contractor for special inspection of lateral framing for shear wall nailing on interior walls. Reviewed the approved plans with the contractor.

Contractor was ready for shear wall nailing inspection. Shear walls were located along the north, south, and east side of the building. Shear wall A, B, and C was inspected for shear wall nailing. The correct wood sheathing, nail size, nail type, and spacing was used. Shear walls were built per the approved plans

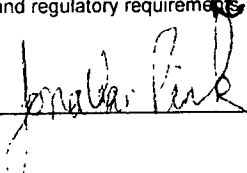
Equipment/Asset Number(s):

To the best of my knowledge, the above WAS  / WAS NOT  performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician:

**JONATHAN PINK**



*Offices Serving the Western United States*

Form 1501 r.2  
Effective Date: 12-20-07

December 4, 2008

KA No. 066-08281  
Permit No. D08-243

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

**RECEIVED**

**DEC 08 2008**

**COMMUNITY  
DEVELOPMENT**

**RE:** In Process Inspection Report  
**McDonald's Tukwila**  
Tukwila, WA

Dear Ms. Andrew,

Enclosed are copies of the compressive strength test results regarding the above referenced project.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila  
McDonald's Corporation, Attn: Julie Andrew, [julie.andrews@us.mcd.com](mailto:julie.andrews@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Christopher Doerschlag  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.



Project No. 066-08281 Cyl. Code 1849 Pour Date 11/10/2008 Report No. 40716  
 Weather overcast/windy Jurisdiction City of Tukwila Permit No. D06-243  
 Project McDonald's Tukwila Engineer 0  
 Location 15210 Pacific Hwy W Tukwila Architect 0  
 Client McDonald's Corporation Contractor Spectrum International.

| CYLINDER REPORT |        |           |       |          |       |       |       |
|-----------------|--------|-----------|-------|----------|-------|-------|-------|
| Concrete        | X      | Other     |       |          |       |       |       |
| Supplier        | Miles  | Plant No. | 201   | Site Mix |       |       |       |
|                 |        |           |       | Mix      | Air   | Unit  |       |
|                 |        |           |       | Slump    | Temp. | Temp. | Wt.   |
| Time            | Truck# | Ticket #  | % Air | (in.)    | (F)   | (F)   | (pcf) |
| 10:15           | m134   | 216547    | 6.1   | 5        | 70    | 55    |       |

| Reported Batch Data        |                |                |
|----------------------------|----------------|----------------|
|                            | Design Weights | Actual Weights |
| Mix No.                    | 04c4af         | 04c4af         |
| Cem. lbs.                  | 470            | 470            |
| F. Ash lbs.                | 94             | 93.6           |
| C. agg. lbs. 1             | 1860           | 1851           |
| C. agg. lbs. 2             |                |                |
| C. agg. lbs. 3             |                |                |
| Sand lbs.                  | 1230           | 1289           |
| Water lbs.                 | 246            | 227            |
| Air Ent. (oz)              | 7              | 7              |
| Other (oz)                 | 33.8           | 33.8           |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Water Added on Job (gals.) |                | 5              |

Placement Area  
 Location Trash enclosure - S.O.G.- 5" thick (at east side) 25' x 20' x 5"  
 Remarks Concrete placed by tailgatin, consolidated by puddling

| Field Test Methods |            |           |
|--------------------|------------|-----------|
| x                  | ASTM C143  | ASTM C138 |
| x                  | ASTM C1064 | ASTM C173 |
| x                  | ASTM C31   | ASTM C172 |
|                    | OTHER      | ASTM C231 |

Inspector

| Laboratory Data |            |                | Design Strength 3,500 @ 28 days |       |      |           | Date Specimens Rec'd. |       |    | Laboratory Test Methods |              |
|-----------------|------------|----------------|---------------------------------|-------|------|-----------|-----------------------|-------|----|-------------------------|--------------|
| Cyl. Code       | Test Date  | Field Cure Age | Dim.                            | Area  | C.F. | Max. Load | Comp. Str. (psi)      | Set # | By |                         | Break Type   |
| 1849-1          | 11/17/2008 | 7              | 4.01                            | 12.62 |      | 48840     | 3,870                 | 1     | dh | 3                       | X ASTM C39   |
| 1849-2          | 12/8/2008  | 28             |                                 |       |      |           |                       |       |    |                         | ASTM C109    |
| 1849-3          | 12/8/2008  | 28             |                                 |       |      |           |                       |       |    |                         | ASTM C617    |
| 1849-4          |            | H              |                                 |       |      |           |                       |       |    |                         | X ASTM C1231 |
| 1849-5          |            |                |                                 |       |      |           |                       |       |    |                         | ASTM C780    |
| 1849-6          |            |                |                                 |       |      |           |                       |       |    |                         | Other        |
| 1849-7          |            |                |                                 |       |      |           |                       |       |    |                         |              |
| 1849-7          |            |                |                                 |       |      |           |                       |       |    |                         |              |

Remarks samples in cure box-east side

Results Reviewed By *KEE*

Date Reviewed

|                |
|----------------|
| Test Results   |
| Conforming     |
| Non-Conforming |

Codes for Break Types: 1: Cone 2: Cone & Split 3: Cone & Shear 4: Shear 5: Columnar (Split)  
 Measurement Uncertainties: ASTM C-39 +/- 8%

Form 03101  
 Revision 3  
 Effective Date 5/12/04

The information provided on this report is prepared for the exclusive use of the client. This report may not be reproduced in any format without the written permission of the client and Krazan & Associ



# Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING & INSPECTION

December 4, 2008

KA No. 066-08140  
Permit No. D08-161

**Mr. Pat Burns**  
Westfield Corporation, Inc.  
633 Southcenter Mall  
Tukwila, WA 98188

**RECEIVED**

**DEC 08 2008**

**COMMUNITY  
DEVELOPMENT**

**RE:** In Process Inspection Report  
**Fidelity Investments**  
Tukwila, WA

Dear Mr. Burns,

Enclosed are copies of the compressive strength test results regarding the above referenced project.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**

Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila  
Peter Cheever: [pcheever@lemessurier.com](mailto:pcheever@lemessurier.com)  
Nicole Needle: [nneedle@lemessurier.com](mailto:nneedle@lemessurier.com)

---

**Offices Serving The Western United States**

922 Valley Avenue NW Suite 101 • Puyallup, Washington 98371 • (253) 939-2500 • Fax: (253) 939-2556

08140 Break Template

**Project No.** 066-08140      **Cyl. Code** 81859      **Pour Date** 11/12/2008      **Report No.** 40595  
**Weather** Overcast / Rain      **Jurisdiction** City of Tukwila      **Permit No.** D08-161  
**Project** Fidelity Investments      **Engineer**  
**Location** 304 Strander Blvd Tukwila      **Architect**  
**Client** Westfield Corporation, Inc.      **Contractor** BN Builders

| CYLINDER REPORT |               |                  |              |                 |              |             |              |
|-----------------|---------------|------------------|--------------|-----------------|--------------|-------------|--------------|
| <b>Concrete</b> | X             | <b>Other</b>     |              |                 |              |             |              |
| <b>Supplier</b> | Glacier       | <b>Plant No.</b> | 282          | <b>Site Mix</b> |              |             |              |
|                 |               |                  |              | <b>Mix</b>      | <b>Air</b>   | <b>Unit</b> |              |
|                 |               |                  | <b>Slump</b> | <b>Temp.</b>    | <b>Temp.</b> | <b>Wt.</b>  |              |
| <b>Time</b>     | <b>Truck#</b> | <b>Ticket #</b>  | <b>% Air</b> | <b>(in.)</b>    | <b>(F)</b>   | <b>(F)</b>  | <b>(pcf)</b> |
| 12:45pm         | 7646          | 242445           |              | 5               |              | 55          |              |

| Reported Batch Data               |                       |                       |
|-----------------------------------|-----------------------|-----------------------|
|                                   | <b>Design Weights</b> | <b>Actual Weights</b> |
| <b>Mix No.</b>                    | 3181                  |                       |
| <b>Cem. lbs.</b>                  | 385                   | 386                   |
| <b>F. Ash lbs.</b>                |                       |                       |
| <b>C. agg. lbs. 1</b>             | 1960                  | 1944                  |
| <b>C. agg. lbs. 2</b>             |                       |                       |
| <b>C. agg. lbs. 3</b>             |                       |                       |
| <b>Sand lbs.</b>                  | 1375                  |                       |
| <b>Water lbs.</b>                 | 30g                   | 28g                   |
| <b>Air Ent. (oz)</b>              |                       |                       |
| <b>WRA</b>                        | 14oz                  | 14oz                  |
| <b>Other (oz)</b>                 |                       |                       |
| <b>Other (oz)</b>                 |                       |                       |
| <b>Other (oz)</b>                 |                       |                       |
| <b>Water Added on Job (gals.)</b> |                       | 10                    |

**Placement Area**  
**Location** Pour Back for columns @ gridlines : D-1.9, C-1.9, B-1.9, A-1, A-7.1, B-1 & E-1  
 Stem Walls @ gridlines A-1.4 / A-1.7  
  
**Remarks** Concrete was placed using a wheelbarrow, mechanical vibrator was used to consolidate the concrete.  
 Reviewed the approved plans.  
 Refer to field report # 8140DFR111208-JP-1

| Field Test Methods |           |
|--------------------|-----------|
| x ASTM C143        | ASTM C138 |
| x ASTM C1064       | ASTM C173 |
| x ASTM C31         | ASTM C172 |
| OTHER              | ASTM C231 |

**Inspector** Jonathan Pink

| Laboratory Data |            |            | Design Strength 3,000 @ 28 days |       |       |      | Date Specimens Rec'd. |                  |              | Laboratory Test Methods |              |
|-----------------|------------|------------|---------------------------------|-------|-------|------|-----------------------|------------------|--------------|-------------------------|--------------|
| Cyl. Code       | Test Date  | Field Cure | Age                             | Dim.  | Area  | C.F. | Max. Load             | Comp. Str. (psi) | Tested Set # |                         | Break Type   |
| 81859-1         | 11/19/2008 |            | 7                               | 4.005 | 12.59 |      | 38225                 | 3,040            | DH           | 2                       | X ASTM C39   |
| 81859-2         | 12/10/2008 |            | 28                              |       |       |      |                       |                  |              |                         | ASTM C109    |
| 81859-3         | 12/10/2008 |            | 28                              |       |       |      |                       |                  |              |                         | ASTM C617    |
| 81859-4         |            |            | H                               |       |       |      |                       |                  |              |                         | X ASTM C1231 |
| 81859-5         |            |            |                                 |       |       |      |                       |                  |              |                         | ASTM C780    |
| 81859-6         |            |            |                                 |       |       |      |                       |                  |              |                         | Other        |
| 81859-7         |            |            |                                 |       |       |      |                       |                  |              |                         |              |
| 81859-7         |            |            |                                 |       |       |      |                       |                  |              |                         |              |

**Remarks**  
**Results Reviewed By** *[Signature]*      **Date Reviewed**

|                |
|----------------|
| Test Results   |
| Conforming     |
| Non-Conforming |

**Codes for Break Types:**      1: Cone      2: Cone & Split      3: Cone & Shear      4: Shear      5: Columnar (Split)  
**Measurement Uncertainties:** ASTM C-39 +/- 8%

# **Krazan & ASSOCIATES, INC.**

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING & INSPECTION

December 3, 2008

KA No. 066-08140  
Permit No. D08-161  
Permit No. D08-316

City of Tukwila  
Attn: Building Department  
6300 Southcenter Blvd.  
Tukwila, WA 98188

**RECEIVED**

**DEC 09 2008**

**COMMUNITY  
DEVELOPMENT**

**RE:** Final Letter  
**Fidelity Investments**  
304 Strander Blvd.  
Tukwila, WA

To Whom It May Concern:

In accordance with your request and authorization, we have performed special testing and inspection services for the above referenced project. The special inspections for this project were:

- Reinforced Concrete
- Non-Destructive Examination - VT
- Reinforcing Masonry

To the best of our knowledge, all work which has been tested and/or inspected has been found to be in general accordance with the approved plans and specifications, engineering revisions, and Chapter 17 of the 2006 International Building Code.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: Westfield Corp, Inc.

LeMessurier Consultants Attn: Peter Cheever, Engineer pcheever@lemessurier.com

**With Offices Serving The Western United States**

922 - Valley Avenue NW Suite 101 • Puyallup, WA 98371 • (253) 939-2500 • Fax: (253) 939-2556

# **Krazan** & ASSOCIATES, INC.

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GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING & INSPECTION

December 2, 2008

KA No. 066-08140  
Permit No. D08-161

**Mr. Pat Burns**  
Westfield Corporation, Inc.  
633 Southcenter Mall  
Tukwila, WA 98188

**RECEIVED**  
**DEC 08 2008**  
**COMMUNITY  
DEVELOPMENT**

**RE:** Special Inspection  
**Fidelity Investments**  
Tukwila, WA

Dear Mr. Burns,

In accordance with your request and authorization, our firm performed special inspections for the above-referenced project. The inspections were performed by our inspectors on November 18, 2008. Copies of our inspector's field reports are attached.

Unless otherwise indicated, the structural activities noted on the attached daily field reports were in accordance with the approved project plans and specifications. A guarantee that the contractor has necessarily constructed the structure in full accord with the plans and specifications is neither intended nor implied.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila  
Peter Cheever: [pcheever@lemessurier.com](mailto:pcheever@lemessurier.com)  
Nicole Needle: [nneedle@lemessurier.com](mailto:nneedle@lemessurier.com)

**Offices Serving The Western United States**

DATE: 11-18-08  
PROJECT #: 066-08140  
PROJECT: FIDELITY INVESTMENT CENTER  
LOCATION: 304 STRANDER BLVD.  
KRAZAN PROJECT MANAGER: KEG

CONTRACTOR: B N BUILDERS  
JURISDICTION: CITY OF TUKWILA  
PERMIT #: DOB-161  
INSPECTOR: MIKE A. PRECIADO  
WEATHER: OVERCAST TEMP: 50°

ON SITE AS REQUESTED BY CONTRACTOR FOR SPECIAL INSPECTION OF ① BASE PLATE GROUTING ② BRICK VENEER MEANS & METHOD ③ MORTAR SAMPLING.

OBSERVED HIGH STRENGTH GROUTING OF BASE PLATES @ COL LINES F/1.6 & F/3.1, USING 50 LB BAGS OF "WIR MEADOWS" SEALTIGHT, 588 GROUT; NON-SHRINK, CONFORMING TO CRD-C621 SPECIFICATIONS 2.01-6.

3 1/2" PINTS OF WATER ADDED PER INSTRUCTIONS FOR FLOWABLE CONSISTENCY (FOR 1" x 12" x 12" AREAS)

CAST (4) SAMPLES FOR STRENGTH TESTING. SEE GROUT REPORT # 08529 FOR DATA & RESULTS.

OBSERVED BRICK VENEER INSTALLATION @ SOUTH WEST CORNER LINES E/1.1 ABOVE LINTEL; USING DUR-O-WALL # 213 CLIPS @ 16" OC HORIZ & VERT WITH 2" OF STYROFOAM INSULATION & 9 GA WIRE @ 16" OC HORIZ THRU CLIPS. MUTUAL MAT'L'S SUPPLIED BRICK & TYPE S MORTAR USED.

CAST (3) MORTAR SAMPLES OF SITE MIXED 80 LB BAGS OF "QUICKCRETE", COMMERCIAL GRADE BLENDED MORTAR, SEE MORTAR REPORT # 06911 FOR DATA & RESULTS OF STRENGTH TESTS.

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS/WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician:

*Mike A. Preciado*

Serving the Western United States

December 2, 2008

KA No. 066-08281  
Permit No. D08-243

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

**RECEIVED**

**DEC 08 2008**

**COMMUNITY  
DEVELOPMENT**

**RE:** In Process Inspection Report  
**McDonald's Tukwila**  
Tukwila, WA

Dear Ms. Andrew,

Enclosed are copies of the compressive strength test results regarding the above referenced project.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila

McDonald's Corporation, Attn: Julie Andrew, [julie.andrews@us.mcd.com](mailto:julie.andrews@us.mcd.com) (pdf)

McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)

McDonald's Corporation, Attn: Christopher Doerschlag

DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.

Project No. 066-08281      Cyl. Code 81754      Pour Date 10/22/2008      Report No. 40678  
 Weather O/C      Jurisdiction City of Tukwila      Permit No. D06-243  
 Project McDonald's Tukwila      Engineer 0  
 Location 15210 Pacific Hwy W Tukwila      Architect 0  
 Client McDonald's Corporation      Contractor Spectrum International.

| CYLINDER REPORT |             |           |       |             |               |               |                |
|-----------------|-------------|-----------|-------|-------------|---------------|---------------|----------------|
| Concrete        | (4) Samples | Other     |       |             |               |               |                |
| Supplier        | Miles       | Plant No. | 202   | Site Mix    |               |               |                |
| Time            | Truck#      | Ticket #  | % Air | Slump (in.) | Mix Temp. (F) | Air Temp. (F) | Unit Wt. (pcf) |
| 10:00am         | M069        | 125605    |       | 5           | 65            | 55            |                |

| Reported Batch Data        |                |                |
|----------------------------|----------------|----------------|
|                            | Design Weights | Actual Weights |
| Mix No.                    | 06400F3        | 06400F3        |
| Cem. lbs.                  | 450            | 448            |
| F. Ash lbs.                | 67             | 68             |
| C. agg. lbs. 1             | 1860           | 1852           |
| C. agg. lbs. 2             |                |                |
| C. agg. lbs. 3             |                |                |
| Sand lbs.                  | 1470           | 1540           |
| Water lbs.                 | 309            | 283            |
| Air Ent. (oz)              |                |                |
| Poly                       | 16oz           | 16oz           |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Water Added on Job (gals.) |                | 5              |

**Placement Area**  
 Location Slab on Grade  
  
**Remarks** Concrete Boom-Pumped  
 Refer to field report # 103543

| Field Test Methods |           |
|--------------------|-----------|
| x ASTM C143        | ASTM C138 |
| x ASTM C1064       | ASTM C173 |
| x ASTM C31         | ASTM C172 |
| OTHER              | ASTM C231 |

Inspector Mike H. Preciado

| Laboratory Data |            |            | Design Strength 3,000 @ 28 days |       |       |      | Date Specimens Rec'd. |                  |       |           | Laboratory Test Methods |              |
|-----------------|------------|------------|---------------------------------|-------|-------|------|-----------------------|------------------|-------|-----------|-------------------------|--------------|
| Cyl. Code       | Test Date  | Field Cure | Age                             | Dim.  | Area  | C.F. | Max. Load             | Comp. Str. (psi) | Set # | Tested By |                         | Break Type   |
| 81754-1         | 10/29/2008 |            | 7                               | 4.01  | 12.62 |      | 43685                 | 3,460            | 1     | DH        | 3                       | X ASTM C39   |
| 81754-2         | 11/19/2008 |            | 28                              | 4.005 | 12.59 |      | 61905                 | 4,920            | 1     | DH        | 2                       | ASTM C109    |
| 81754-3         | 11/19/2008 |            | 28                              | 4.005 | 12.59 |      | 62990                 | 5,000            | 1     | DH        | 2                       | ASTM C617    |
| 81754-4         |            |            | H                               |       |       |      |                       |                  | 1     |           |                         | X ASTM C1231 |
| 81754-5         |            |            |                                 |       |       |      |                       |                  |       |           |                         | ASTM C780    |
| 81754-6         |            |            |                                 |       |       |      |                       |                  |       |           |                         | Other        |
| 81754-7         |            |            |                                 |       |       |      |                       |                  |       |           |                         |              |
| 81754-7         |            |            |                                 |       |       |      |                       |                  |       |           |                         |              |

Remarks  
 Results Reviewed By *RE*

Date Reviewed

| Test Results   |
|----------------|
| X Conforming   |
| Non-Conforming |

Codes for Break Types:      1: Cone      2: Cone & Split      3: Cone & Shear      4: Shear      5: Columnar (Split)  
 Measurement Uncertainties: ASTM C-39 +/- 8%

Form 03101  
 Revision 3  
 Effective Date 5/12/04  
 The information provided on this report is prepared for the exclusive use of the client. This report may not be reproduced in any format without the written permission of the client and Krazean & Associ



# **Krazan** & ASSOCIATES, INC.

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GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING & INSPECTION

December 2, 2008

KA No. 066-08281  
Permit No. D08-243

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

**RECEIVED**

**DEC 08 2008**

**COMMUNITY  
DEVELOPMENT**

**RE: Special Inspection**  
**McDonald's Tukwila**  
Tukwila, WA

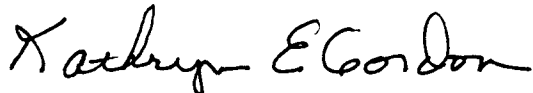
Dear Ms. Andrew,

In accordance with your request and authorization, our firm performed special inspections for the above-referenced project. The inspections were performed by our inspectors from November 17 through November 21, 2008. Copies of our inspector's field reports are attached.

Unless otherwise indicated, the structural activities noted on the attached daily field reports were in accordance with the approved project plans and specifications. A guarantee that the contractor has necessarily constructed the structure in full accord with the plans and specifications is neither intended nor implied.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila

McDonald's Corporation, Attn: Julie Andrew, [julie.andrews@us.mcd.com](mailto:julie.andrews@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Christopher Doerschlag  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.

**Offices Serving The Western United States**

DATE: 11-17-08 CONTRACTOR: SPECTRUM ENTERPRISES LLC.  
 PROJECT #: 066-08281 PERMIT NO: B08-243  
 PROJECT: McDONALD'S TUKWILA INSPECTOR: JONATHAN PINK  
 LOCATION: 15210 TUKWILA INTERNATIONAL BLVD. JURISDICTION: CITY OF TUKWILA  
 KRAZAN PROJECT MANAGER: KEG WEATHER: FOG TEMP: 48°F to 55°F

**SPECIAL INSPECTION OF LATERAL FRAMING.**

On site as requested by the contractor for special inspection of lateral framing for shear wall nailing and hold down inspection. Reviewed the approved plans with the contractor.

Contractor was ready for shear wall nailing and hold down inspection. Shear walls were located along the north, south, and east wall. The correct wood sheathing, nail size, nail type and spacing was used. Shear wall A, B and C was inspected for nailing and hold downs. Shear walls were built per the approved plans

\*\* Anchor bolts in the base plates do not have the correct washers installed and will have to be inspected on another date.

Equipment/Asset Number(s):

\*\* work in progress

To the best of my knowledge, the above WAS  / WAS NOT  performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician:

**JONATHAN PINK**

*Offices Serving the Western United States*

DATE: 11-20-08 CONTRACTOR: SPECTRUM ENTERPRISES LLC.  
PROJECT #: 066-08281 PERMIT NO: B08-243  
PROJECT: McDONALD'S TUKWILA INSPECTOR: JONATHAN PINK  
LOCATION: 15210 TUKWILA INTERNATIONAL BLVD. JURISDICTION: CITY OF TUKWILA  
KRAZAN PROJECT MANAGER: KEG WEATHER: OVERCAST RAIN TEMP: 43°F to 55°F

**SPECIAL INSPECTION OF LATERAL FRAMING.**

On site as requested by the contractor for special inspection of lateral framing for shear wall anchor bolts. Reviewed the approved plans with the contractor.

Contractor was ready for shear wall anchor bolt inspection. Shear walls A, B, and C had the correct anchor bolt size and spacing for each shear wall type. The correct type and size of washer was installed on all the anchor bolts in the three shear walls. This is report approves report # 8281-DFR-111708-JP-1 dated 11-17-08

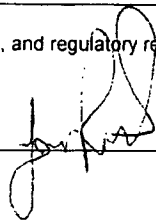
Equipment/Asset Number(s):

To the best of my knowledge, the above WAS  / WAS NOT  performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician:

**JONATHAN PINK**



*Offices Serving the Western United States*

DATE: 11-21-08<sup>SE</sup>  
PROJECT #: 046-08281  
PROJECT: McDONALDS - TUKWILA  
LOCATION: 15210 PACIFIC HWY S.  
KRAZAN PROJECT MANAGER: K.E.G.

CONTRACTOR: SPECTRUM ENTERPRISES  
JURISDICTION: CITY OF TUKWILA  
PERMIT #: D08-243  
INSPECTOR: GEORGE NAILL  
WEATHER: CLOUDY TEMP: 44°f

STRUCTURAL STEEL

ARRIVED ON SITE AS REQUESTED BY THE CONTRACTOR TO PERFORM STRUCTURAL STEEL INSPECTION, IN CONFORMANCE TO PROJECT PLANS & SPECS.

- 1) MET WITH THE CONTRACTOR TO VERIFY INSPECTION & REVIEW PLANS.
- 2) VISUAL INSPECTION OF SLIP CRITICAL BOLTED CONNECTIONS OF PLATE AREA. REVERED HEAVY HEX HEAD 1"Ø NUTS HAVE BEEN TIGHTENED TO UNKNOWN METHOD FOUND 1 BOLT NUT WAS FINGER LOOSE.
- 3) NOTIFIED CONTRACTOR OF FINDINGS AND THAT SKIDMORE TESTING AND TURN OF THE NUT METHOD (REQUIRING FULL TIME INSPECTION) WAS REQUIRED. CONNECTIONS HAVE BEEN FRAMED AROUND.
- 4) CONTRACTOR HAS CONTACTED E.O.R. FOR DIRECTION AND WILL RESCHEDULE INSPECTION ACCORDINGLY.



Equipment/Asset Number(s):

To the best of my knowledge, the above WAS / WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative: [Signature]

Technician: [Signature]

*Serving the Western United States*

November 17, 2008

KA No. 066-08281  
Permit No. D08-243

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

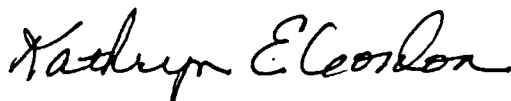
**RE: In Process Inspection Report**  
**McDonald's Tukwila**  
Tukwila, WA

Dear Ms. Andrew,

Enclosed are copies of the compressive strength test results regarding the above referenced project.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila  
McDonald's Corporation, Attn: Julie Andrew, [julie.andrews@us.mcd.com](mailto:julie.andrews@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Christopher Doerschlag  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.

RECEIVED

NOV 24 2008



Project No. 066-08281 Cyl. Code 81754 Pour Date 10/22/2008 Report No. 40678  
 Weather O/C Jurisdiction City of Tukwila Permit No. D06-243  
 Project Tukwila - McDonalds Engineer 0  
 Location 15210 Pacific Hwy. S. Architect 0  
 Client 0 Contractor Spectrum International.

| Field Data |             | CYLINDER REPORT |       |          |           |           |          |
|------------|-------------|-----------------|-------|----------|-----------|-----------|----------|
| Concrete   | (4) Samples | Other           |       |          |           |           |          |
| Supplier   | Miles       | Plant No.       | 202   | Site Mix |           |           |          |
| Time       | Truck#      | Ticket #        | % Air | Slump    | Mix Temp. | Air Temp. | Unit Wt. |
| 10:00am    | M069        | 125605          |       | 5        | 65        | 55        |          |

| Reported Batch Data        |                |                |
|----------------------------|----------------|----------------|
|                            | Design Weights | Actual Weights |
| Mix No.                    | 06400F3        | 06400F3        |
| Cem. lbs.                  | 450            | 448            |
| F. Ash lbs.                | 67             | 68             |
| C. agg. lbs. 1             | 1860           | 1852           |
| C. agg. lbs. 2             |                |                |
| C. agg. lbs. 3             |                |                |
| Sand lbs.                  | 1470           | 1540           |
| Water lbs.                 | 309            | 283            |
| Air Ent. (oz)              |                |                |
| Poly                       | 16oz           | 16oz           |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Other (oz)                 |                |                |
| Water Added on Job (gals.) |                | 5              |

Placement Area  
 Location Slab on Grade

Remarks Concrete Boom-Pumped  
 Refer to field report # 103543

| Field Test Methods |           |
|--------------------|-----------|
| x ASTM C143        | ASTM C138 |
| x ASTM C1064       | ASTM C173 |
| x ASTM C31         | ASTM C172 |
| OTHER              | ASTM C231 |

Inspector Mike H. Preciado

| Laboratory Data |            |            | Design Strength 3,000 @ 28 days |      |       |      |           | Date Specimens Rec'd. |       |    | Laboratory Test Methods |              |
|-----------------|------------|------------|---------------------------------|------|-------|------|-----------|-----------------------|-------|----|-------------------------|--------------|
| Cyl. Code       | Test Date  | Field Cure | Age                             | Dim. | Area  | C.F. | Max. Load | Comp. Str. (psi)      | Set # | By |                         | Break Type   |
| 81754-1         | 10/29/2008 |            | 7                               | 4.01 | 12.62 |      | 43685     | 3,460                 | 1     | DH | 3                       | X ASTM C39   |
| 81754-2         | 11/19/2008 |            | 28                              |      |       |      |           |                       | 1     |    |                         | ASTM C109    |
| 81754-3         | 11/19/2008 |            | 28                              |      |       |      |           |                       | 1     |    |                         | ASTM C617    |
| 81754-4         |            |            | H                               |      |       |      |           |                       | 1     |    |                         | X ASTM C1231 |
| 81754-5         |            |            |                                 |      |       |      |           |                       |       |    |                         | ASTM C780    |
| 81754-6         |            |            |                                 |      |       |      |           |                       |       |    |                         | Other        |
| 81754-7         |            |            |                                 |      |       |      |           |                       |       |    |                         |              |
| 81754-7         |            |            |                                 |      |       |      |           |                       |       |    |                         |              |

Remarks

Results Reviewed By *KEE*

Date Reviewed

Test Results  
 Conforming  
 Non-Conforming

Codes for Break Types: 1: Cone 2: Cone & Split 3: Cone & Shear 4: Shear 5: Columnar (Split)

Measurement Uncertainties: ASTM C-39 +/- 8%

Form 03101

Revision 3

Effective Date 5/12/04

The information provided on this report is prepared for the exclusive use of the client. This report may not be reproduced in any format without the written permission of the client and Krazan & Associ.

November 17, 2008

KA No. 066-08281  
Permit No. D08-243

**Ms. Julie Andrew**  
McDonald's Corporation  
12131 113th Ave NE, Suite 103  
Kirkland, WA 98034

**RE: Special Inspection**  
**McDonald's Tukwila**  
Tukwila, WA

Dear Ms. Andrew,

In accordance with your request and authorization, our firm performed special inspections for the above-referenced project. The inspections were performed by our inspectors from October 3 through November 10, 2008. Copies of our inspector's field reports are attached.

Unless otherwise indicated, the structural activities noted on the attached daily field reports were in accordance with the approved project plans and specifications. A guarantee that the contractor has necessarily constructed the structure in full accord with the plans and specifications is neither intended nor implied.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,  
**KRAZAN & ASSOCIATES, INC**



Kathryn E. Gordon  
Project Manager  
Puyallup Division

CC: City of Tukwila  
McDonald's Corporation, Attn: Julie Andrew, [julie.andrews@us.mcd.com](mailto:julie.andrews@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Doug Bates, [doug.bates@us.mcd.com](mailto:doug.bates@us.mcd.com) (pdf)  
McDonald's Corporation, Attn: Christopher Doerschlag  
DR Strong Consulting Engineers, Attn: Richard Olsen, P.E.

**RECEIVED**

NOV 24 2008

**COMMUNITY  
DEVELOPMENT**

**Offices Serving The Western United States**



DATE: 10-3-08  
PROJECT #: 08281  
PROJECT: McDonalds Tukwila  
LOCATION: 15210 Pac. Exp Hwy S.  
KRAZAN PROJECT MANAGER: K.E.G

CONTRACTOR: Spectrum ent.  
JURISDICTION: City of Tukwila  
PERMIT #: D08-243  
INSPECTOR: Michael Thomas  
WEATHER: Overcast TEMP: 48°

In Spectos on site as requested by the contractor to perform special inspection of Reinforced concrete placement.

① met with contractor to review plans & specs regarding slump, air, minimum compressive strength & the break schedule for miles mix ID# 06400F3.

② prior to placement re-steel was signed off by Randy Hansen please see DFR# 8281 DFR T00308-SH-1

③ monitored mix design & water added as well as clearance during placement of concrete

④ contractor placed 63 yds<sup>3</sup> +/- of miles mix ID# 06400F3 in footings at grid lines 1&5/A-E, A&E/1-5

⑤ contractor placed all materials per plan & specs.

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician:

Michael Thomas

Serving the Western United States

This field report indicates our inspector's observation and testing results based on the site condition and contractor's activities. This information is subject to review prior to final submittal. By signing this report, our inspector does not accept responsibility for validity of results. Some information on this report has been provided by others on site.

DATE: 3 October 2008 CONTRACTOR: Spectrum Enterprises  
PROJECT #: 066-08281 PERMIT NO: D08-243  
PROJECT: McDonalds – Tukwila INSPECTOR: Randy Hansen  
LOCATION: 15210 Pacific hwy S. JURISDICTION: City of Tukwila  
KRAZAN PROJECT MANAGER: KEG WEATHER: Overcast TEMP: 57 F

**Reinforced Concrete Inspection**

On site as requested by the general contractor for reinforced concrete inspection of perimeter footings for the Entire building.

Checked the resteel per details on sheet S3.0 of the approved plans for size, grade, spacing, location, count, lap, and clearance per the approved plans. The resteel was found to be in place per plan. The contractor corrected some minor clearance issues prior to placement of concrete.

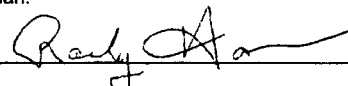
Krazan Placement Inspector Mike Thomas on site to relieve me and cast cylinders and observe progress of concrete placement.

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS  / WAS NOT  performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician:



*Offices Serving the Western United States*

DATE: OCTOBER 22, 2008  
PROJECT #: 066-08281  
PROJECT: TUKWILA-MCDONALDS  
LOCATION: 15210 PACIFIC HWY S  
KRAZAN PROJECT MANAGER: KEG

CONTRACTOR: SPECTRUM INTER.  
JURISDICTION: TUKWILA, WA  
PERMIT #: DOG-243  
INSPECTOR: MIKE H. PRECIADO  
WEATHER: CLEAR TEMP: 50°

(REINFORCED CONCRETE INSPECTION)

ON SITE FOR SPECIAL INSPECTION OF 5' THK. SLAB ON GRADE FOR MCDONALD'S RESTAURANT.

CHECKED SLAB FOR VAPER BARRIER-IN-PLACE, INSULATION @ PERIMETER-IN PLACE, AND CONCRETE CONTAINING FIBERMESH, REBAR PER PLANS-IN-PLACE.

OBSERVED PLACEMENT OF 90 YARDS OF 3000 PSI CONCRETE SUPPLIED BY MILES, MONITORED TRUCKS FOR MIX DESIGN# 06400F3, SLUMP, TEMP., WATER, BATCH TIMES.

CAST (4) SAMPLE STRENGTH CYLINDERS FOR LAB TESTING. SEE CR# 40678 FOR BATCH DATA.

CONCRETE CONSOLIDATED BY PUDDELING, AND H.F. MECHANICAL VIBRATOR.

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician:

Mike H. Preciado

*Serving the Western United States*

This field report indicates our inspector's observation and testing results based on the site condition and contractor's activities. This information is subject to review prior to final submittal. By signing this report, our inspector does not accept responsibility for validity of results. Some information on this report has been provided by others on site.

DATE: 10-31-08  
PROJECT #: 066-03281  
PROJECT: McDONALDS - TURKULA  
LOCATION: 15210 PACIFIC HWYS  
KRAZAN PROJECT MANAGER: KEG

CONTRACTOR: SPECTRUM ENTERPRISES  
JURISDICTION: TURKULA WA  
PERMIT #: DOB-243  
INSPECTOR: JAMIS BIANO  
WEATHER: OVCAST TEMP: 55°

INSPECTOR ON SITE AS SCHEDULED BY THE CONTRACTOR  
FOR VISUAL INSPECTION ON STRUCTURAL STEEL WELDING  
AND HIGH STRENGTH BOLTED CONNECTIONS.

REVIEWED THE APPROVED PLANS & SPECIFICATIONS  
PLANS CALL OUT ALL SLIP-CRITICAL AND SPECIFIC  
BOLTED JOINTS INDICATED ON DETAILS ARE TO BE  
FULLY TENSIONED.

INSPECTED THE STEEL FRAMING, OBSERVED ALL CONNECTIONS  
WERE BOLTED (WITH EXCEPTION AT 2 LOCATIONS - RFI PENDING).  
CONTRACTOR INDICATED THE BOLTS WERE IMPACTED-TENSIONED

THE CONTRACTOR WAS NOTIFIED OF THE FOLLOWING DISCREPANCY:  
PRE-INSTALLATION VERIFICATION REQUIREMENT WASNT PERFORMED  
BEFORE INSTALLING THE BOLTS

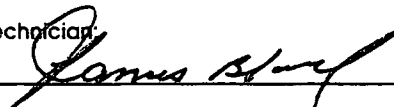
ADVISED CONTRACTOR TO CONTACT ENGINEER AND REQUEST  
DIRECTION ON RESOLVING THIS SITUATION.

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative:

Technician:



*Serving the Western United States*

This field report indicates our inspector's observation and testing results based on the site condition and contractor's activities. This information is subject to review prior to final submittal. By signing this report, our inspector does not accept responsibility for validity of results. Some information on this report has been provided by others on site.

DATE: 11-07-08 CONTRACTOR: SPECTRUM ENTERPRISES LLC.  
 PROJECT #: 066-08281 PERMIT NO: B08-243  
 PROJECT: McDONALDS TUKWILA INSPECTOR: JONATHAN PINK  
 LOCATION: 15210 TUKWILA INTERNATIONAL BLVD. JURISDICTION: CITY OF TUKWILA  
 KRAZAN PROJECT MANAGER: \_\_\_\_\_ WEATHER: OVERCAST RAIN TEMP: 57°F to 62°F

**SPECIAL INSPECTION OF LATERAL FRAMING.**

On site as requested by the contractor for special inspection of lateral framing for roof diaphragm nailing and strapping. Reviewed the approved plans with the contractor.

Contractor was ready for diaphragm nailing and strapping inspection of the roof. Inspection was done at from the east end of the building to gridline E and from 1 to 5. The correct wood sheathing, straps, and type of nail was used. All areas were nail off to the minimum requirement except of the areas labelled with note 7.

--- Areas labelled with note 7 on the approved plans will need to have more nails added to meet the 2.5" on center requirement.

Contractor informed the framer of the areas that need to have nails added per note 7 on the approved plans. Areas labelled with note 7 were re-nailed per the approved plan.

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS  WAS NOT  performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative: \_\_\_\_\_

Technician: JONATHAN PINK

*Offices Serving the Western United States*

Form 1501 r.2  
Effective Date: 12-20-07

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING  
CONSTRUCTION TESTING AND INSPECTION

DATE: 11-10-08  
PROJECT #: 006-08281  
PROJECT: McDONALDS TUKWILA  
LOCATION: 15210 PACIFIC HWY S.  
KRAZAN PROJECT MANAGER: KEG

CONTRACTOR: SPECTRUM ENTERPRISES  
JURISDICTION: CITY OF TUKWILA  
PERMIT #: DOB-243  
INSPECTOR: MIKE A. PRELIADO  
WEATHER: OVERCAST / WINNY TEMP: 48°-55°

ON SITE AS REQUESTED BY CONTRACTOR FOR SPECIAL INSPECTION OF FTGS & 5" SLAB ON GRADE; REINF STEEL & CONCRETE PLACEMENT AT TRASH ENCLOSURE, 25' x 20'.  
INSPECTED REBAR AND WIRE MESH, PER APPROVED DWG & DETAILS, FOR SIZE, SPACING, SUPPORT, CLEARANCES, CORNER BARS & LAPS. VERIFIED 6x6-2.9x2.9 WWF FOR 5" S.O.G., AND FTGS 18" DEEP x 2'-0" WIDE ALL AROUND, WITH 2#5 CONT HORIZ. AND #5 VERTS FOR CMU WALLS @ 16" OC w/ 40" DIA LAP. ALL REBAR & WIRE MESH IN PLACE PER DWG S.

OBSERVED PLACEMENT OF 21 YARDS OF 3500 PSI CONCRETE FOR TRASH ENCLOSURE S.O.G. AND FTGS.  
CONCRETE SUPPLIED BY MILES AND PLACED BY TAILGATING. CONSOLIDATED BY PUDDLING.  
MONITORED TRUCKS FOR MIX DESIGN # 04C42F, COMMERCIAL, w/AIR, SLUMP 4" I, & WATER.

CAST (4) SAMPLE STRENGTH CYLINDERS FOR TESTING.  
SEE C.I.R. # 40716 FOR BATCH DATA & INFO.

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS / WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

Superintendent/Representative: \_\_\_\_\_ Technician: Mike A. Preliado

Serving the Western United States

DOB-243 / DOB-27A

**spectrum enterprises llc**

9810 48th avenue east  
tacoma, wa 98446  
253.539.4766 fax 253.539.4767  
wa lic: spectel968ma

**RECEIVED**  
SEP 12 2008  
TUKWILA  
PUBLIC WORKS

Letter of Transmittal

September 10, 2008

Mr. Greg Villanueva  
**City of Tukwila**  
Public Works Department  
6300 Southcenter Blvd., Suite 100  
Tukwila, WA 98188

RE: **McDonald's Restaurant #46-0005 (Riverton #00472)**  
**15210 Pacific Hwy South**  
**Tukwila, WA 98188**

We are sending you via UPS the following:

- 1 Aggregate Submittal for Con Tech Stormwater Vault
- 2 Geotech Fabric
- 3 Cc Contech Stormchamber System
- 4 Contech Storm Filter System

Ken 253 330-4831

These are transmitted: For your review and comment

*Thank you.*

Signed: Ken Beaulaurier  
[ken@spectrumenterprises.us](mailto:ken@spectrumenterprises.us)

Copy to: file

# Glacier Northwest - Aggregate Submittal



Date: April 1, 2008

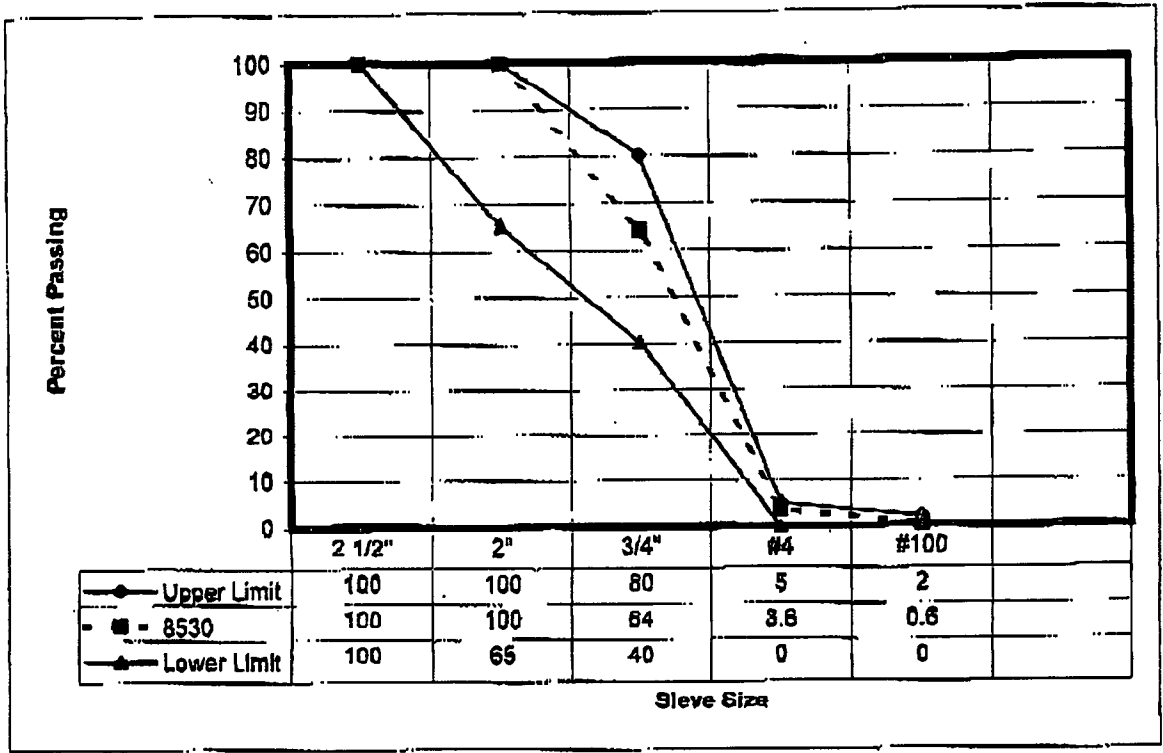
Product Number: 8530  
 Product Description: Shoulder Ballast  
 Specification Number: WSDOT 9-03.9(2)

Source: Lafarge Canada Location: Texada Island, BC  
 WSDOT Pit Number: QS-CA-8

Specification:

|               |              |                 |   |
|---------------|--------------|-----------------|---|
| 2 1/2" square | 100% passing | % Fracture      | - |
| 2" square     | 65-100       | Sand Equivalent |   |
| 3/4" square   | 40-80        | L.A. Wear       |   |
| U.S. No 4     | 0-5          | Degradation:    | - |
| U.S. No 100   | 0-2          | Dust Ratio      |   |

|                   |       |                  |      |
|-------------------|-------|------------------|------|
| Specific Gravity: | 2.85  | % Fracture:      | 100% |
| Absorption:       | -     | Sand Equivalent: | -    |
| L.A. Abrasion:    | 17.1% | Dust Ratio:      |      |
| Degradation:      | -     |                  |      |





# PRODUCT DATA SHEET

## GEOTEX® 601

GEOTEX 601 is a polypropylene, staple fiber, needlepunched nonwoven geotextile produced by Propex, and will meet the following Minimum Average Roll Values (MARV) when tested in accordance with the methods listed below. The fibers are needed to form a stable network that retains dimensional stability relative to each other. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils.

GEOTEX 601 conforms to the property values listed below.<sup>1</sup> Propex performs internal Manufacturing Quality Control (MQC) tests that have been accredited by the Geosynthetic Accreditation Institute - Laboratory Accreditation Program (GAI-LAP).

| PROPERTY                                 | TEST METHOD | MARV                    |                           |
|--|-------------|-------------------------|---------------------------|
|  |             | ENGLISH                 | METRIC                    |
| <b>Mechanical</b>                        |             |                         |                           |
| Tensile Strength (Grab)                  | ASTM D-4632 | 160 lbs                 | 712 N                     |
| Elongation                               | ASTM D-4632 | 50%                     | 50%                       |
| Puncture                                 | ASTM D-4833 | 85 lbs                  | 378 N                     |
| CBR Puncture                             | ASTM D-6241 | 410 lbs                 | 1824 N                    |
| Mullen Burst                             | ASTM D-3786 | 280 psi                 | 1930 kPa                  |
| Trapezoidal Tear                         | ASTM D-4533 | 60 lbs                  | 267 N                     |
| <b>Endurance</b>                         |             |                         |                           |
| UV Resistance                            | ASTM D-4355 | 70%                     | 70%                       |
| <b>Hydraulic</b>                         |             |                         |                           |
| Apparent Opening Size (AOS) <sup>3</sup> | ASTM D-4751 | 70 US Std. Sieve        | 0.212 mm                  |
| Permittivity                             | ASTM D-4491 | 1.30 sec <sup>-1</sup>  | 1.30 sec <sup>-1</sup>    |
| Water Flow Rate                          | ASTM D-4491 | 110 gpm/ft <sup>2</sup> | 4480 l/min/m <sup>2</sup> |
| Roll Sizes                               |             | 12.5 ft x 360 ft        | 3.81 m x 109.8 m          |
|  |             | 15 ft x 300 ft          | 4.57 m x 91.5 m           |

### NOTES:

- The property values listed above are effective 08/2008 and are subject to change without notice.
- Values shown are in wetter principal direction. Minimum average roll values (MARV) are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported.
- Maximum average roll value.

**PROPEX**  
GEOSYNTHETICS

THE ADVANTAGE CREATORS™

Propex Inc.  
6025 Lee Highway, Suite 425  
PO Box 22788  
Chattanooga, TN 37422

PH: 423 899 0444  
PH: 800 621 1273  
FAX: 423 899 7619  
www.geotextile.com

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# STORMCHAMBER™ UNDERGROUND DETENTION SYSTEM MCDONALDS - TUKWILA TUKWILA, WA

| INDEX: |             |
|--------|-------------|
| 1      | COVER SHEET |
| 2      | LAYOUT PLAN |
| 3      | DETAILS     |

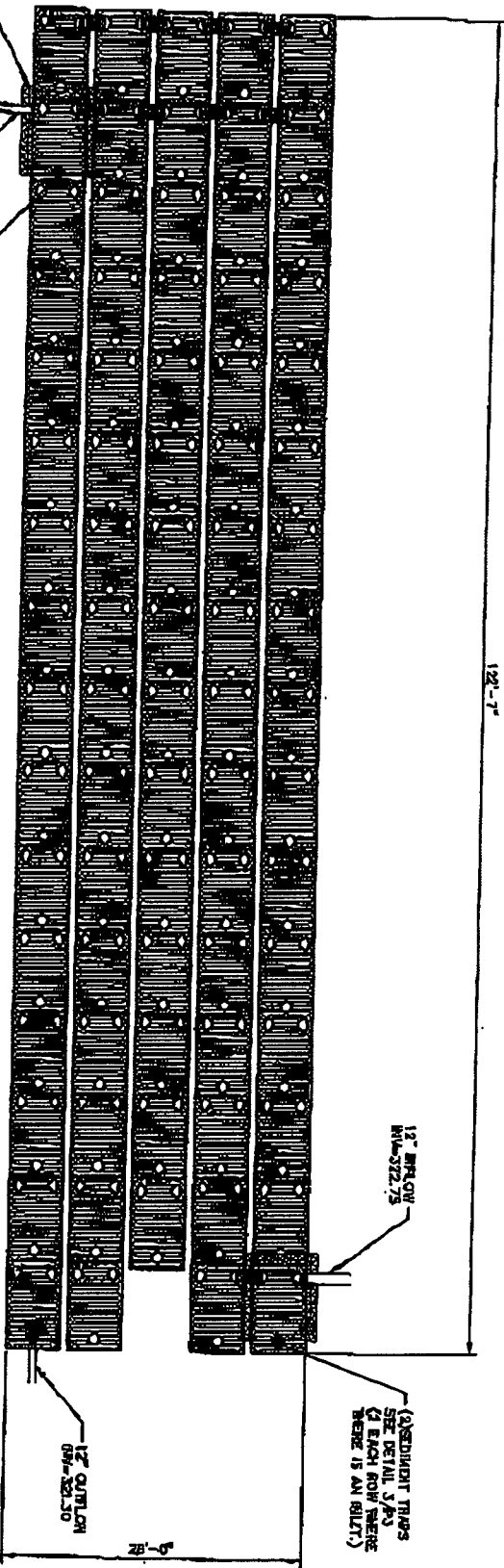
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THE UNDERSIGNED HEREBY APPROVES THE ATTACHED (S) PAGES

CUSTOMER \_\_\_\_\_ DATE \_\_\_\_\_

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(2) 40T HEAVY-DUTY STABILIZATION SLITTING (17%)  
 12" INVERTING RW-322.75  
 (2) 60MM TRAPS SEE DETAIL 3/8'S (2 EACH ROW WHERE THERE IS AN INLET)



LAYOUT PLAN  
 SCALE: 1" = 10'

**CONTECH**  
 CONSTRUCTION TECHNOLOGY  
 1000 CENTRE STREET, SUITE 200  
 THE HUBBARD, 1000 CENTRE STREET, SUITE 200  
 0 20778787

DESIGNED BY: [Name]  
 DRAWN BY: [Name]  
 CHECKED BY: [Name]  
 APPROVED BY: [Name]

QUANTITIES:  
 78 TOTAL UNITS  
 3 SHUT UNITS  
 88 MIDDLE UNITS  
 9 END UNITS  
 9.215 CF STORAGE  
 (SEE ABOVE BILLING)

ESTIMATED QUANTITIES:  
 GEO-TEXTILE = (2) 100L x 1,000 SQ. YDS.  
 HEAVY-DUTY NETTING = (8) 447 PILES  
 LEFT-OVER NETTING = (3) 900L x 500 FT  
 PVC COUSERS-OVER PIPES (~17) = 2 TOTL.

STORMWATER (8" STORM ABOVE AND 8" BELOW)

NOTED: THERE IS ADDITIONAL STORAGE IN THE 12" STORM BUFFER AROUND THE STRIP

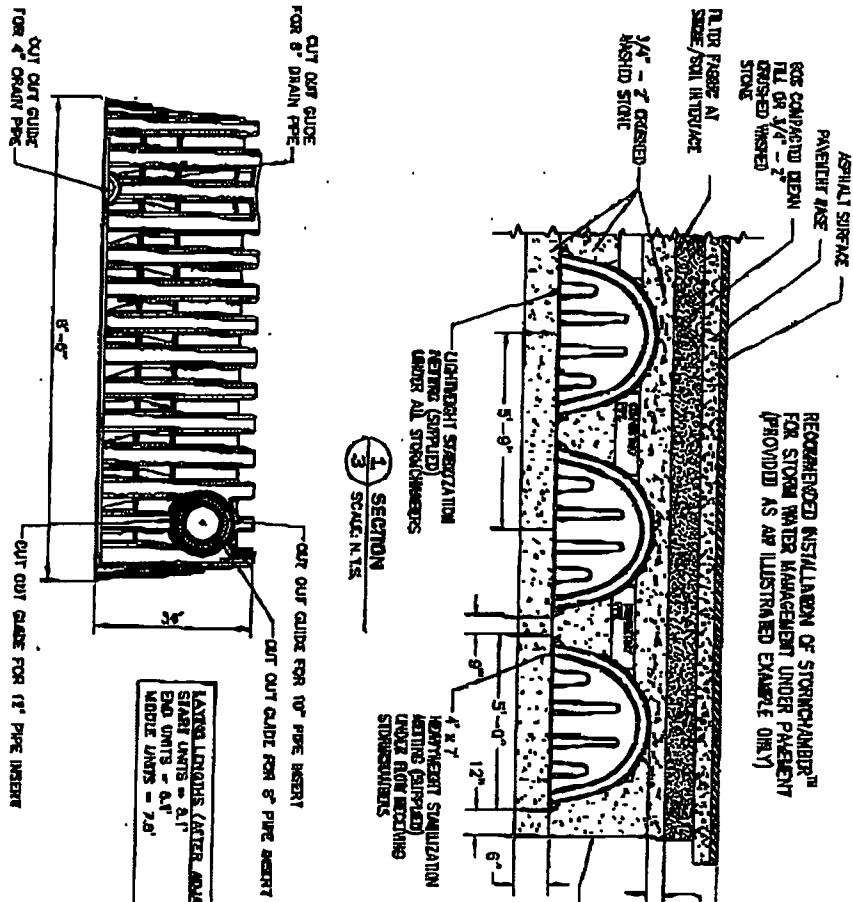
**LAYOUT PLAN**  
 STORAGE/RAIN LINDER/REGULATING DETENTION SYSTEM  
 HERRINGVALE - TONGVALE  
 TONGVALE, WA

DATE: 9/11/08  
 DRAWN BY: [Name]  
 CHECKED BY: [Name]  
 APPROVED BY: [Name]

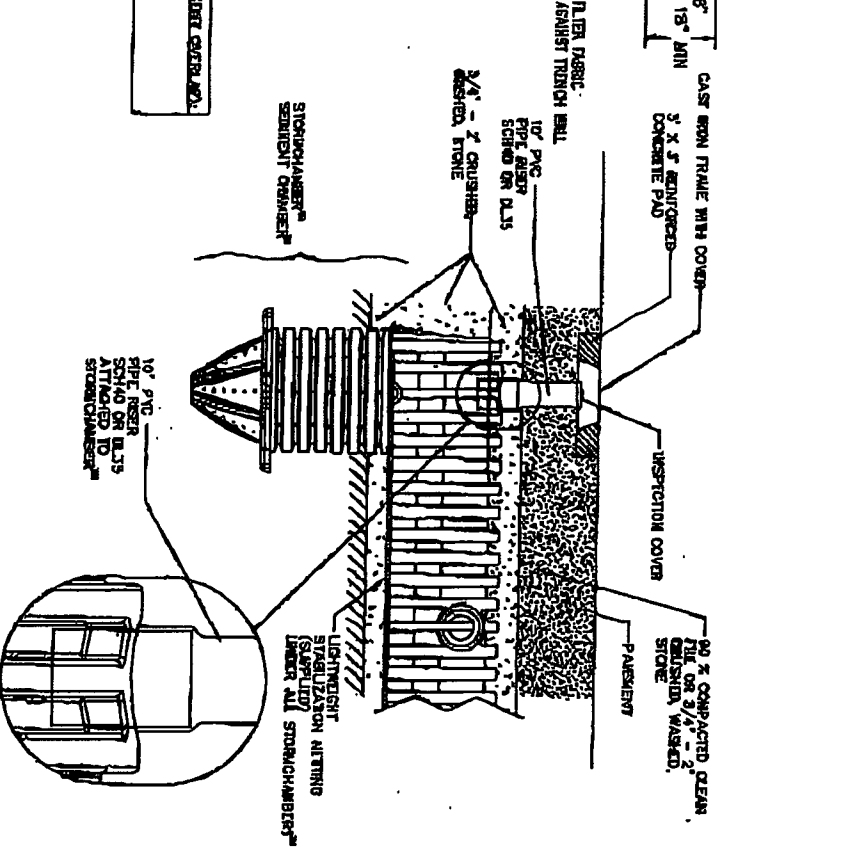
12" INVERTING RW-322.75  
 (2) 60MM TRAPS SEE DETAIL 3/8'S (2 EACH ROW WHERE THERE IS AN INLET)

12" OUTLET RW-322.75

| NO. | DATE | SYMBOLS | DESCRIPTION | BY | APPROVED BY |
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1 SECTION  
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2 SECTION TRAP DETAIL  
 SCALE: N.T.S.

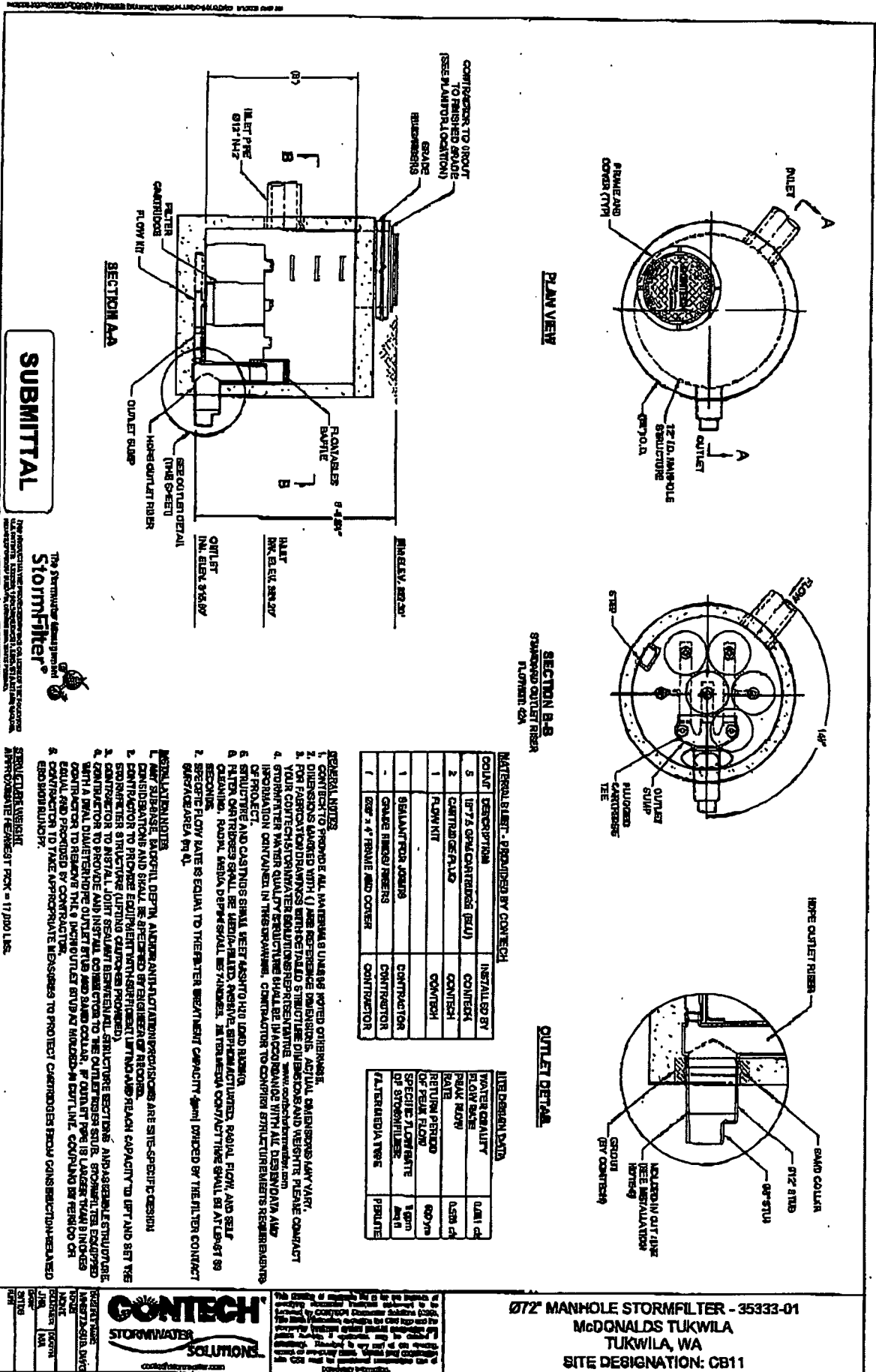
LANTERNS LANTERNS LANTERNS  
 START UNITS - 3.1'  
 END UNITS - 0.8'  
 MIDDLE UNITS - 7.8'

COURTESY OF SERRA

**CONTECH**  
 CONSTRUCTION TECHNOLOGY  
 1000 WEST 10TH AVENUE, SUITE 100  
 DENVER, CO 80202  
 TEL: 303.733.1111  
 WWW.CONTECH.COM

STORMWATER UNDERGROUND DRAINAGE SYSTEMS  
 MEDANALDS - TUNNIA  
 TUNNIA, WA

REV. 08/08  
 DATE 08/08  
 BY JH  
 CHECKED JH  
 SCALE 3/4\"/>



**SUBMITTAL**

The Stormwater Management Plan  
**StormFilter**  
 CONTECH STORMWATER SOLUTIONS

STRUCTURE HEIGHT  
 APPROXIMATE WEIGHT 17,000 LBS.

- GENERAL NOTES**
- CONTRACTOR TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
  - DIMENSIONS LISTED WITH (+) ARE REFERRED DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
  - FOR FABRICATION DRAWINGS WITH HORIZONTAL STRUCTURE DIMENSIONS AND VERTICAL RISE CONTACT YOUR CONTRACTOR/DRIVER SOLUTIONS REPRESENTATIVE. www.contechwater.com
  - STORMWATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN AND INSTALLATION REQUIREMENTS IN THE DRAWINGS. CONTRACTOR TO CONSIDER STRUCTURE WEIGHTS REQUIREMENTS OF PROJECT.
  - STRUCTURE AND CASTINGS SHALL WEIGH TO 110 LBS/M<sup>2</sup>.
  - FLTER CARTRIDGES SHALL BE MEDIA-BLIND, REVERSE-SPIN/MANUFACTURED, RADIAL FLOW, AND SELF-CLEANING. RADIAL MEDIA DEPOSITION BEYONDS. MATERIALS CONTRACTIVE SHALL BE AT LEAST 99% RESIN.
  - REGARDING FLOW RATE IS EQUAL TO THE FILTER WEIGHT CAPACITY (GPM) DIVIDED BY THE FILTER CONTACT AREA (SQUARE FT).
- INSTALLATION NOTES**
- AWF SUBBASE, RADIIUM DEPTH, ANCHOR ANTI-LIFTING PROVISIONS ARE SITE-SPECIFIC DESIGN.
  - CANISTER AND SHALL BE SPECIFIED BY DESIGNER OF RECORD.
  - CONTRACTOR TO PROVIDE EQUIPMENT FOR LIFTING AND REACH CAPACITY TO LIFT AND SET THE CANISTER STRUCTURE (LIFTING CLAMPS PROVIDED).
  - CONTRACTOR TO PROVIDE JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLY STRUCTURE WITH A DUAL CURE JOINT SEALANT (SEE INSTRUCTIONS ON THE OUTLET RISER SUB). CONTRACTOR TO PROVIDE JOINT SEALANT TO REMOVE THE 1/2" INCH OUTLET BRUNN HOLE IN CAST LIME. COULD BE REINFORCED OR EQUAL TO THAT PROVIDED BY CONTRACTOR.
  - CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM ONSIDE REACTION-WEALED EROSION DURING.

**MATERIAL LIST - PROVIDED BY CONTRACTOR**

| QTY | DESCRIPTION               | INSTALLER BY |
|-----|---------------------------|--------------|
| 5   | 1/2" GA. CARTRIDGES (BLU) | CONTECH      |
| 2   | CANISTER (BLU)            | CONTECH      |
| 1   | FLOW KIT                  | CONTECH      |
| 1   | INSTALLATION JOISTS       | CONTRACTOR   |
| -   | GRADE FINISH FIBERS       | CONTRACTOR   |
| 1   | 8" x 4" FRAME AND COVER   | CONTRACTOR   |

**LINE DESIGN DATA**

| WATER QUALITY                   | UNIT                    |
|---------------------------------|-------------------------|
| FLOW RATE                       | 1.583 cfs               |
| PEAK FLOW RATE                  | 1.583 cfs               |
| RETURN PERIOD OF PEAK FLOW      | 60-75                   |
| SPECIFIC FLOW RATE OF STRUCTURE | 1.8 gpm/ft <sup>2</sup> |
| FILTER MEDIA TYPE               | PERLITE                 |

**Ø72" MANHOLE STORMFILTER - 35333-01**  
 McDONALDS TUKWILA  
 TUKWILA, WA  
 SITE DESIGNATION: CB11



CONTECH WATER SOLUTIONS  
 10000 100th Ave NE  
 Everett, WA 98203  
 (425) 335-7700  
 www.contechwater.com



11835 NE Glenn Widing Dr  
Portland, OR 97220  
Toll-free: 800.548.4667  
Fax: 800.561.1271  
contechstormwater.com

# SUBMITTAL

To:

From:

Correnna Armstrong

Date:

9/10/08

Project Name:

McDonalds - Tukwila

Location:

Tukwila, WA

Fax:

Project #:

35333

Phone:

Copies/Pages:

We are sending you via:

| Serial # | Date      | No.      | Description                               |
|----------|-----------|----------|---|
| 35333-01 | 9/10/2008 | 35333.01 | 72" MANHOLE STORMFILTER                   |
| 35333-02 | 9/10/2008 | 35333.02 | STORMCHAMBER UNDERGROUND DETENTION SYSTEM |

### Remarks:

- Please confirm that the structure(s) shown on the attached submittal(s) meet(s) the requirements of your project.
- Please note heaviest section weights provided on submittal(s).
- Please submit your approval or request revisions by checking the appropriate box below and returning this form and the approved submittal(s) to CONTECH Stormwater Solutions.
- Upon receipt of "approved" submittal(s), the system(s) shall be released to manufacture. Production time is estimated at 4-6 weeks.

### THE ATTACHED DRAWING(S) ARE:

- APPROVED AS SUBMITTED. No written comments/changes. Please cast the structure(s).
- APPROVED AS NOTED. Please cast the structure(s).
- NOT APPROVED. Do not cast the structure(s). Revise and resubmit.

AUTHORIZED APPROVAL \_\_\_\_\_  
(Please sign above)

APPROX. DATE NEEDED \_\_\_\_/\_\_\_\_/\_\_\_\_





11835 NE Glenn Wlding Dr  
Portland, OR 97220  
Toll-free: 800.548.4667  
Fax 800.561.1271  
contechstormwater.com

**Treatment Specific  
Terms and Conditions of Sale**

**1.0 Price**

- 1.1 Prices quoted are valid for 30 days from quote date.
- 1.2 Prices are based on the purchase of all listed items.
- 1.3 Prices are FOB origin with freight allowed to jobsite and unloading by others.
- 1.4 Final price is subject to change upon confirmation of system design parameters.
- 1.5 Price includes manhole frames and covers and risers to grade, unless otherwise noted: Vortach®<sup>®</sup>, VortClear™<sup>™</sup>, VortFilter® and VortSentry® prices do not include risers or grade rings. Manhole frames and covers of a type other than Seller's standard, if required, may be provided at an additional cost. VortClear™ hatch for accessing the coalescing media shall be provided.
- 1.6 The prices given do not include any Federal, State, local taxes, duties, tariffs or other expenses or assessments imposed on products and shipment of Seller. Any such taxes in effect at the time of shipment shall be paid by the Purchaser. Consequently, in addition to the quoted prices in effect at the time of sale, the amount of any such taxes will be paid by the Purchaser, or in lieu thereof, shall provide the Seller with the Tax Exemption Certificate and/or Resale Certificate acceptable to the taxing authorities.

**2.0 Order Cancellation**

- 2.1 Purchaser may cancel this order due to project cancellation. In the event of such cancellation, Purchaser will be liable for payment as follows: 15% of the quoted amount if the order is cancelled prior to approval of submittals; 25% of the quoted amount if the order is cancelled after the approval of submittals; 50% of the quoted amount if the order has been released to manufacture, plus any amounts Seller incurs from outside vendors (precasters, fabricators).
- 2.2 Orders canceled for reasons other than project cancellation may be billed at greater amounts at the sole discretion of Seller. Seller's security interest shall survive any cancellation or termination of this agreement.

**3.0 Submittal Approval**

- 3.1 Purchaser acknowledges that Seller or his agent shall accomplish production of ordered products in accordance with approved submittals signed by Purchaser. Production of said products will commence only upon receipt of purchase order and receipt by Seller of approved submittals.

**4.0 Delivery and Installation**

- 4.1 Purchaser agrees to provide suitable access for Seller's delivery trucks, traffic control and labor, and at least two people to assist in the unloading of the products.
- 4.2 Price includes one-hour waiting time and one hour off-load time. Delays caused by the Purchaser, which are over and above the two-hour period, will be billed according to costs incurred. The cost of delays caused by CONTECH Stormwater Solutions or their agent, which are over and above this two-hour period, may be credited to the Purchaser upon agreement by CONTECH Stormwater Solutions.
- 4.3 Unit price does not include lifting equipment. Customer is responsible for supplying a crane of sufficient lift and reach capacity and rigging for lifting system(s) and/or system components off delivery trucks, setting in place and all related construction and site activity to and from the system including bed preparation of crushed stone or other.
- 4.4 Seller will under no circumstances accept back-charges without prior written approval. Should problems arise during delivery/installation, Seller must be notified by Purchaser immediately. Failure to do so may result in additional costs to Purchaser that cannot be credited.
- 4.5 Purchaser agrees to provide a safe delivery site and comply with all Federal, State and local safety requirements. Purchaser further agrees to hold Seller harmless and to defend any and all actions, claims, suits, and proceedings that may subject Seller to liability due to Purchaser's failure to provide a safe delivery site.

**5.0 Payment Terms**

- 5.1 Payment terms are Net 30 days from date of shipment, subject to credit approval after receipt of acceptable credit references supplied by Purchaser.
- 5.2 Payment for purchases from Seller shall not be subject to retainage under any circumstances.

**6.0 Notice Regarding Defective Materials**

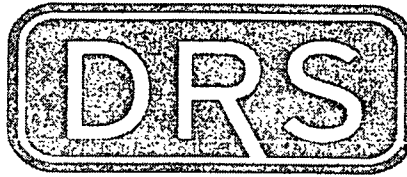
- 6.1 Should the products delivered hereunder not conform to the requirements of this contract or be otherwise defective, Purchaser shall provide written notice to Seller within warranty period. If Purchaser fails to provide said written notice within this period, Purchaser shall have waived and relinquished all claims for replacement and repair of non-conforming or defective products. In the event that products fail to comply with the requirements of this contract, and Purchaser provides timely written notice, Seller will, at its discretion, repair, replace or refund the purchase price, or portion thereof, of non-conforming or defective products within a reasonable amount of time.

**7.0 Unqualified Acceptance**

- 7.1 This agreement must be accepted on its exact terms. If Purchaser proposes additional or different terms, its response shall constitute a counter-offer and no contract shall come into existence without Seller's assent to the counter-offer terms.

**8.0 Limitation of Liability**

- 8.1 Seller's total liability for all losses and damages arising out of any and all causes whatsoever including, without limitation, defects in the goods, services or documentation supplied under this agreement, shall in no event exceed the purchase price of the applicable item(s).



D. R. STRONG CONSULTING ENGINEERS INC.  
 Engineers Planners Surveyors  
 10604 NE 38<sup>th</sup> Place #101  
 Kirkland WA 98033  
 PHONE 425-827-3063 FAX 425-827-2423

**RECEIVED**  
 JUN 30 2009  
 TUKWILA  
 PUBLIC WORKS

**LETTER OF TRANSMITTAL**

|                                    |                                      |
|------------------------------------|--------------------------------------|
| <b>TO:</b><br>Joanna Spencer       | <b>FROM:</b><br>Travis W. Price ASLA |
| <b>ADDRESS:</b><br>City of Tukwila | <b>DATE:</b><br>June 30, 2009        |
| For Delivery                       |                                      |
| <b>RE:</b><br>Tukwila McDonald's   | <b>PROJECT NUMBER:</b><br>07052      |

COPY OF LETTER       PLANS       PRINTS       SPECIFICATIONS

FOR YOUR USE       FOR REVIEW       FOR APPROVAL

| COPIES | DATE     | DESCRIPTION                  |
|--------|----------|------------------------------|
| 1      | 06.25.09 | As-built Drawings Mylars     |
| 1      | 06.30.09 | O&M Manual                   |
| 1      | 06.30.09 | CD of CAD drawings and PDF's |
|        |          |                              |

**NOTES/COMMENTS:**

Attached are all of the as-built drawings, CD and Operations and Maintenance Manual. The remaining turn-over documents will be submitted to the city after McDonald's Legal team and the city of Tukwila mutually agree on the language.

D08-243



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# Operations and Maintenance Manual (O&M)

for

## Tukwila McDonalds

15120 Pacific Highway S. Tukwila, Washington

RECEIVED

JUN 30 2009

TUKWILA  
PUBLIC WORKS

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**DRS Project No. 07052**

*Owner/Applicant*

McDonald's USA, LLC  
12131 113<sup>th</sup> Ave NE Suite 103  
Kirkland, WA 98032

*Report Prepared by*



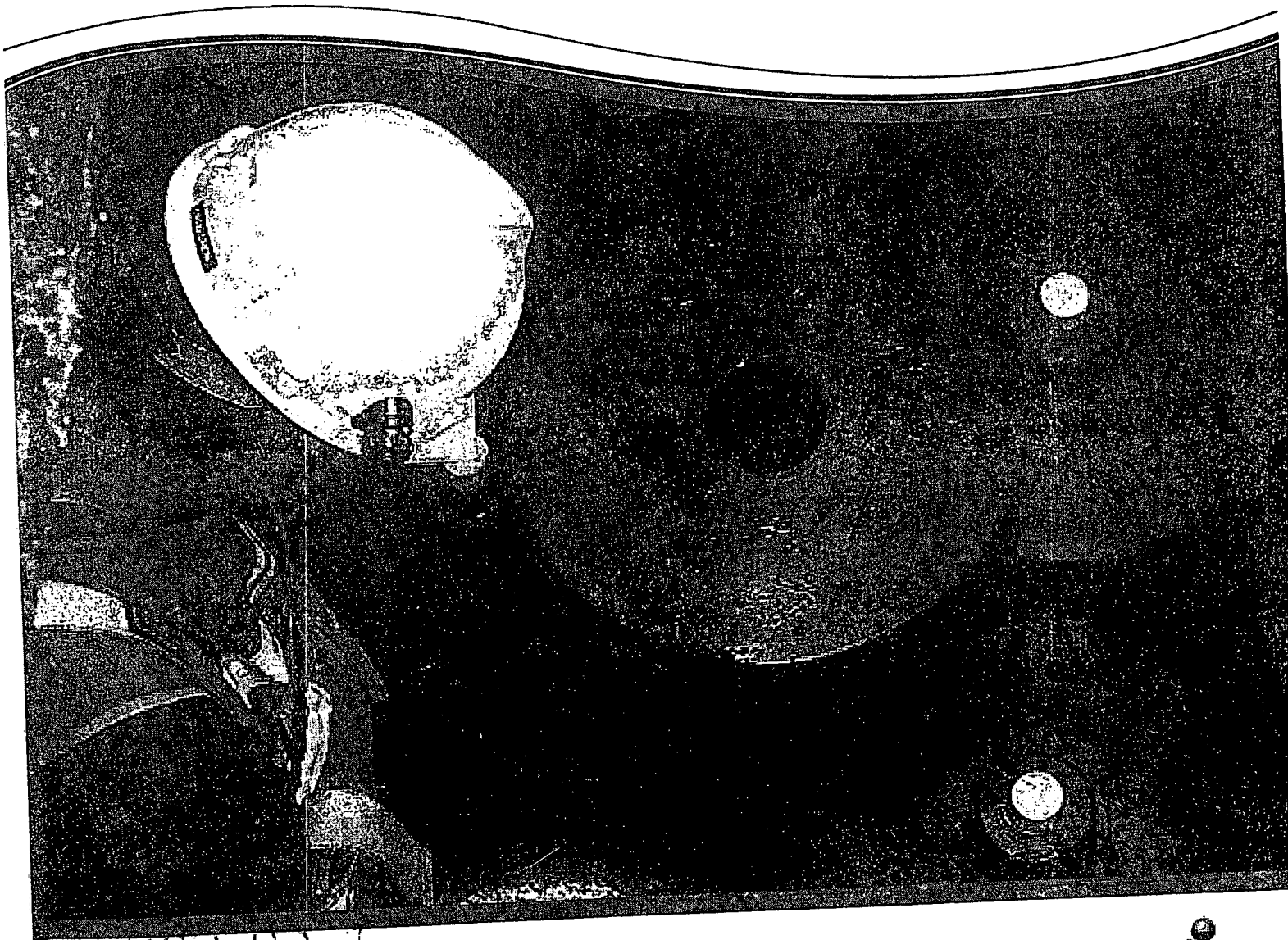
D. R. STRONG Consulting Engineers, Inc.  
10604 N.E. 38th Place, Suite 101  
Kirkland WA 98033  
(425) 827-3063

**Report Issue Date**  
June 30, 2009

D08-0243

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# StormFilter Inspection and Maintenance Procedures



7-25-18-101

## Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

## Maintenance Procedures

Although there are likely many effective maintenance options, we believe the following procedure is efficient and can be implemented using common equipment and existing maintenance protocols. A two step procedure is recommended as follows:

### 1. Inspection

Inspection of the vault interior to determine the need for maintenance.

### 2. Maintenance

Cartridge replacement

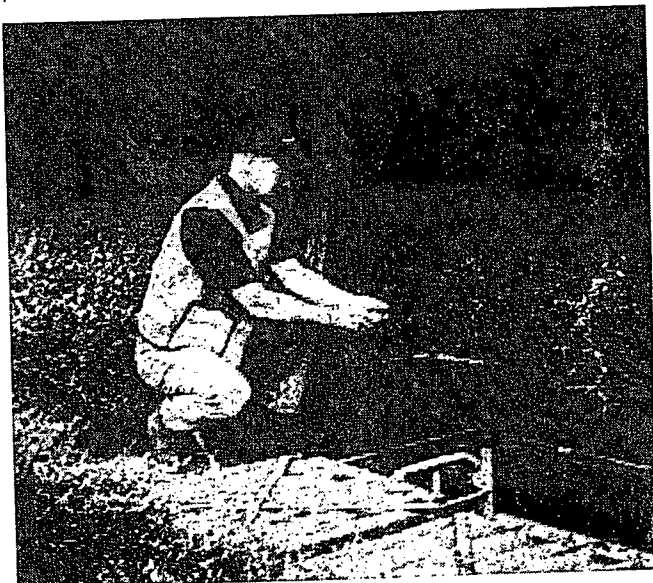
Sediment removal

## Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.



In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, in late summer to early fall when flows into the system are not likely to be present.

## Maintenance Frequency

The primary factor controlling timing of maintenance of the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs.

Prior to the development of the maintenance database, the following maintenance frequencies should be followed:

### Inspection

One time per year

After major storms

### Maintenance

As needed, based on results of inspection (The average maintenance lifecycle is approximately 1-3 years)

Per Regulatory requirement

In the event of a chemical spill

Frequencies should be updated as required. The recommended initial frequency for inspection is one time per year. StormFilter units should be inspected after major storms.

Sediment removal and cartridge replacement on an as needed basis is recommended unless site conditions warrant.

Once an understanding of site characteristics has been established, maintenance may not be needed for one to three years, but inspection is warranted and recommended annually.

## Inspection Procedures

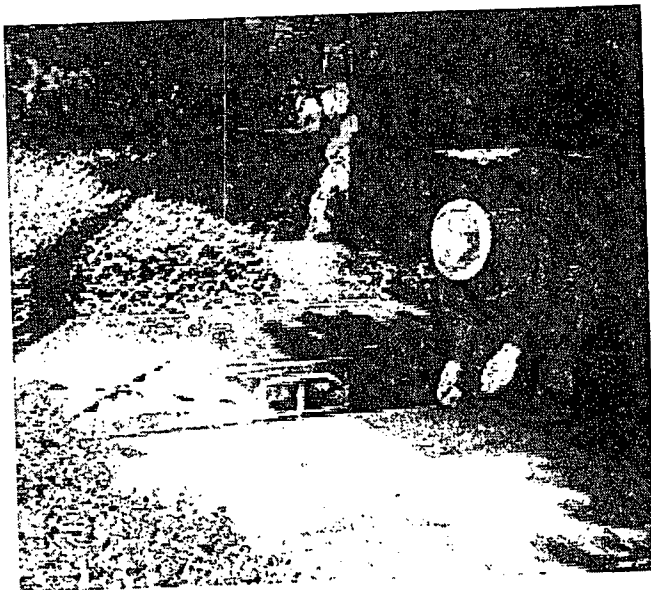
The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

**Warning:** In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH Stormwater Solutions immediately.

To conduct an inspection:

**Important:** Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.



3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.

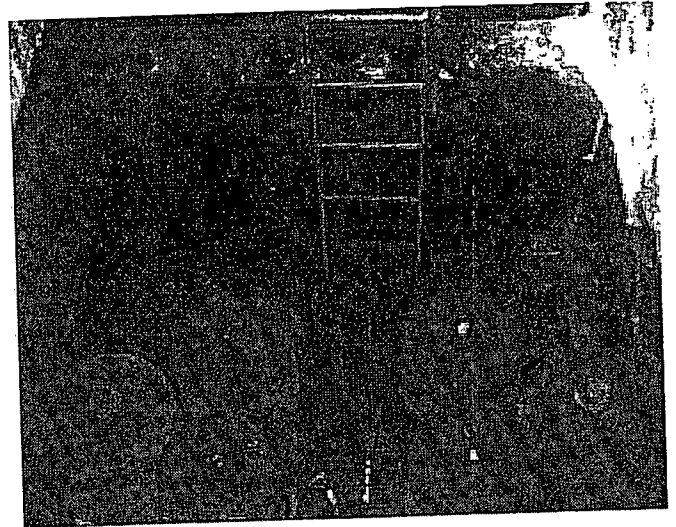
7. Remove safety equipment.

8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.

9. Discuss conditions that suggest maintenance and make decision as to whether or not maintenance is needed.

## Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)



1. Sediment loading on the vault floor.
  - a. If  $>4$ " of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
  - a. If  $>1/4$ " of accumulation, maintenance is required.
3. Submerged cartridges.
  - a. If  $>4$ " of static water in the cartridge bay for more than 24 hours after end of rain event, maintenance is required.
4. Plugged media.
  - a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
  - a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
  - a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
  - a. If pronounced scum line (say  $\geq 1/4$ " thick) is present above top cap, maintenance is required.
8. Calendar Lifecycle.
  - a. If system has not been maintained for 3 years maintenance is required.

## Assumptions

- No rainfall for 24 hours or more
- No upstream detention (at least not draining into StormFilter)
- Structure is online
- Outlet pipe is clear of obstruction
- Construction bypass is plugged

## Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

**Important:** If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from CONTECH Stormwater Solutions.

**Warning:** In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH Stormwater Solutions immediately.

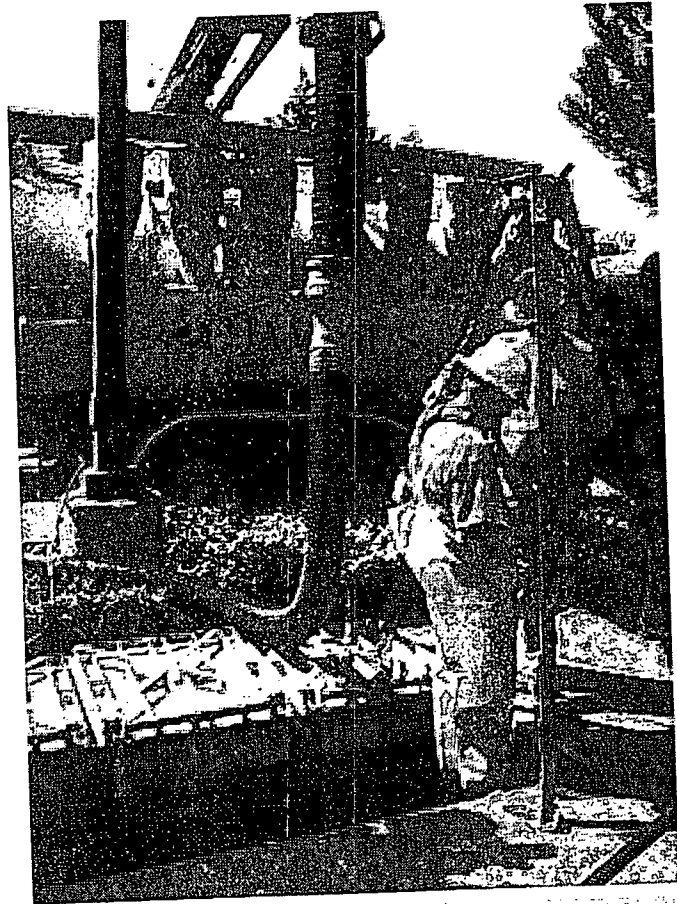
To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

### Method 1:

- A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Unscrew (counterclockwise rotations) each filter cartridge from the underdrain connector. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact CONTECH Stormwater Solutions for suggested attachment devices.



**Important:** Note that cartridges containing leaf media (CSF) do not require unscrewing from their connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and could be capped during the maintenance activity to prevent sediments from entering the underdrain manifold.

- B. Remove the used cartridges (up to 250 lbs. each) from the vault.

**Important:** Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner unless CONTECH Stormwater Solutions performs the maintenance activities and damage is not related to discharges to the system.

- C. Set the used cartridge aside or load onto the hauling truck.
- D. Continue steps a through c until all cartridges have been removed.

### Method 2:

- A. Enter the vault using appropriate confined space protocols.
- B. Unscrew the cartridge cap.
- C. Remove the cartridge hood screws (3) hood and float.
- D. At location under structure access, tip the cartridge on its side.

**Important:** Note that cartridges containing media other than the leaf media require unscrewing from their threaded connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and capped if necessary.

- D. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.
- E. Set the empty, used cartridge aside or load onto the hauling truck.
- F. Continue steps a through e until all cartridges have been removed.



- 8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
- 9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors. The connectors are short sections of 2-inch schedule 40 PVC, or threaded schedule 80 PVC that should protrude about 1" above the floor of the vault. Lightly wash down the vault interior.
  - a. If desired, apply a light coating of FDA approved silicon lube to the outside of the exposed portion of the connectors. This ensures a watertight connection between the cartridge and the drainage pipe.
  - b. Replace any damaged connectors.

10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.

- 11. Close and fasten the door.
- 12. Remove safety equipment.
- 13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used empty cartridges to CONTECH Stormwater Solutions.



## Related Maintenance Activities -

### Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

## Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.



800.925.5240

[contechstormwater.com](http://contechstormwater.com)

## Support

- Drawings and specifications are available at [contechstormwater.com](http://contechstormwater.com).
- Site-specific design support is available from our engineers.

©2007 CONTECH Stormwater Solutions

CONTECH Construction Products Inc. provides site solutions for the civil engineering industry. CONTECH's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other CONTECH division offerings, visit [contech-cpi.com](http://contech-cpi.com) or call 800.338.1122

Nothing in this catalog should be construed as an expressed warranty or an implied warranty of merchantability or fitness for any particular purpose. See the CONTECH standard quotation or acknowledgement for applicable warranties and other terms and conditions of sale.

# Inspection Report

Date: \_\_\_\_\_ Personnel: \_\_\_\_\_

Location: \_\_\_\_\_ System Size: \_\_\_\_\_

System Type: Vault  Cast-In-Place  Linear Catch Basin  Manhole  Other  Date: \_\_\_\_\_

Sediment Thickness in Forebay: \_\_\_\_\_

Sediment Depth on Vault Floor: \_\_\_\_\_

Structural Damage: \_\_\_\_\_

Estimated Flow from Drainage Pipes (if available): \_\_\_\_\_

Cartridges Submerged: Yes  No  Depth of Standing Water: \_\_\_\_\_

StormFilter Maintenance Activities (check off if done and give description)

Trash and Debris Removal: \_\_\_\_\_

Minor Structural Repairs: \_\_\_\_\_

Drainage Area Report \_\_\_\_\_

Excessive Oil Loading: Yes  No  Source: \_\_\_\_\_

Sediment Accumulation on Pavement: Yes  No  Source: \_\_\_\_\_

Erosion of Landscaped Areas: Yes  No  Source: \_\_\_\_\_

Items Needing Further Work: \_\_\_\_\_

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

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Review the condition reports from the previous inspection visits.

## StormFilter Maintenance Report

Date: \_\_\_\_\_ Personnel: \_\_\_\_\_

Location: \_\_\_\_\_ System Size: \_\_\_\_\_

System Type: Vault  Cast-In-Place  Linear Catch Basin  Manhole  Other

List Safety Procedures and Equipment Used: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

### System Observations

Months in Service: \_\_\_\_\_

Oil in Forebay: Yes  No

Sediment Depth in Forebay: \_\_\_\_\_

Sediment Depth on Vault Floor: \_\_\_\_\_

Structural Damage: \_\_\_\_\_

### Drainage Area Report

Excessive Oil Loading: Yes  No  Source: \_\_\_\_\_

Sediment Accumulation on Pavement: Yes  No  Source: \_\_\_\_\_

Erosion of Landscaped Areas: Yes  No  Source: \_\_\_\_\_

### StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes  No  Details: \_\_\_\_\_

Replace Cartridges: Yes  No  Details: \_\_\_\_\_

Sediment Removed: Yes  No  Details: \_\_\_\_\_

Quantity of Sediment Removed (estimate?): \_\_\_\_\_

Minor Structural Repairs: Yes  No  Details: \_\_\_\_\_

Residuals (debris, sediment) Disposal Methods: \_\_\_\_\_

Notes:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## *Maintenance of StormChamber™ Systems*

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The StormChambers provide great flexibility in facilitating maintenance tasks through different arrangements of StormChamber system components. These can be used individually, or in combination, to best accommodate local requirements, hydrologic parameters, and engineering design constraints. Each is discussed individually below:

1) Pre-treatment devices.

Under normal circumstances, a pre-treatment device is not necessary. However, under certain conditions, or local requirements, pre-treatment devices can be useful. Filtering, swirl concentrators, or other types of pre-treatment devices can be installed upstream of the StormChamber system for removal of sediment, floatables, oil and grease, etc. Their use is particularly helpful for stormwater “hot spot” areas, such as automobile repair shops, where abnormally high concentrations of pollutants such as oil and grease can be expected.

2) Vacuum truck tube through 10 inch clean-out riser.

The StormChambers are designed with a defined top portal area at the “down-flow” end of the chamber that can be cut out to accept up to a 10 inch diameter riser pipe (see drawings in this section). The 10 inch riser can be used as an observation well and for access of a vacuum truck tube that can be used to remove sediment. The “down-flow” ends of the StormChambers have end walls that are closed on the bottom (see enclosed drawings). The closed bottom functions similar to a coffer dam, with most of the sediment depositing prior to flowing into the next chamber, facilitating its removal through the riser pipe, which is positioned directly above this area.

It is recommended, at a minimum, that clean-out risers be placed at the last chamber of each row of StormChambers which receive the flow from the stormwater inlet(s).

3) Sacrificial StormChamber row (in accommodation of the commonly utilized management practice of benign neglect).

An additional row of StormChamber can be added for accumulation of sediment with minimal effect on the stormwater storage requirements of the system. This would be utilized as the “first row” of chambers – the row that accepts the stormwater flow from the inlet structures. Because the flow from the first row of chambers will have to make 90 degree turns through connecting pipes into the adjacent row, velocity of flow will decrease and most of the transported sediment load deposits within the first row of StormChambers.

4) Grated inlet structures.

The use of fully grated inlet structures will keep the vast majority of debris out of the StormChamber system. (It is suggested that these be placed near the entrance to the establishment being constructed as an incentive for owner maintenance).

5) Inlet structures with sumps.

The use of inlet structures with a 2-4 foot sump is recommended. This will allow for additional capture of sediment that can easily be removed with a vacuum truck or other device before it gets into the StormChamber system.

A sumped inlet structure placed at both ends of the first row of StormChambers can also be used to facilitate sediment removal within the StormChamber system. Under this alternative, one or more additional chamber(s) is added to the beginning and end of the first row, the end of each being inserted directly into the sumped inlet structures. This provides for physical access into the first row for maintenance (see "Example Configurations" section).

6) Protected stormwater inlets during construction.

It is highly recommended that, under any of the above alternatives, the StormChamber system not be opened to receive stormwater flows until construction of the site has been completed. Even then, all stormwater inlets must be protected from sediment loading until the site is completely stabilized. Complete stabilization implies that the construction site has been cleared of construction-related debris and has incurred at least two storm events sufficient to wash most soil and other particulate matter off impervious surfaces.

### *Inspection and Maintenance Schedule*

Inspect through the risers quarterly and after each large storm event. It is recommended that a log book be maintained showing the depth of water in the StormChamber at each observation in order to determine the rate at which the StormChamber system dewateres after runoff producing storm events. Once the performance characteristics of the StormChamber have been verified, the monitoring schedule can be reduced to an annual basis, unless the performance data suggests that a more frequent schedule is required. Sediment should be removed when deposits approach within six inches of the invert heights of connecting pipes between StormChamber rows, or in sumped inlet structures.

Contact *HydroLogic Solutions* for technical assistance at 1.877.426.9128  
or email us at [info@hydrologicsolutions.com](mailto:info@hydrologicsolutions.com).

# OPERATIONS AND MAINTENANCE MANUAL

## CATCH BASINS

The Type 1-L catch basins have a one-foot deep sump, and the Type 2 catch basins have a two-foot deep sump for sediment accumulation. These sumps should be periodically checked and the sediment removed when accumulated to more than 1/3 of the depth from the bottom of the basin to the invert of the lowest pipe into or out of the basin. Grates should be cleaned when trash or debris of more than ½ cubic foot is located immediately in front of the basin opening, or is blocking capacity of the basin by more than 10%. Conveyance pipes should be periodically checked and cleaned when more than 20% of the pipe diameter is obstructed by accumulated sediment or debris.

Accumulated sediment and stagnant conditions may cause noxious gases to form and accumulate in the vault. Vault maintenance procedures must meet OSHA confined space entry requirements, which includes clearly marking entrances to confined space areas. This may be accomplished by hanging a removable sign in the access riser(s), just under the access lid.

Sediment in the vault should be removed when the 1-foot (average) sediment zone is full plus 6 inches. Sediment should be tested for toxicants in compliance with current disposal requirements if visual or olfactory indications of pollution are noticed. Water drained or pumped from vaults prior to sediment removal may be discharged to the downstream conveyance (i.e. roadside ditch), if it is not excessively turbid (i.e. if water appears translucent when held to light), and if floatable debris and visual petroleum sheens are removed. Excessively turbid water (i.e. water appears opaque when held to light) should be discharged only after the solids have been removed.

Floating debris and accumulated petroleum products should be removed as needed, but at least annually. The floating oil should be removed from wetvaults used as oil/water separators when oil accumulation exceeds one inch.

Perform inspections of all components quarterly during the first year of operation, then annually thereafter. For more detailed maintenance instructions, refer to the standards contained at the end of this section.

#### No. 4 – Control Structure/Flow Restrictor

| Maintenance Component | Defect                                  | Condition When Maintenance is Needed  | Results Expected When Maintenance is Performed  |
|-----------------------|---|---|---|
| General               | Trash and Debris (Includes Sediment)    | Material exceeds 25% of sump depth or 1 foot below orifice plate.                           | Control structure orifice is not blocked. All trash and debris removed.                           |
|                       | Structural Damage                       | Structure is not securely attached to manhole wall.   | Structure securely attached to wall and outlet pipe.  |
|                       |   | Structure is not in upright position (allow up to 10% from plumb).                          | Structure in correct position.  |
|                       |   | Connections to outlet pipe are not watertight and show signs of rust.                       | Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. |
|                       |   | Any holes--other than designed holes--in the structure.                                     | Structure has no holes other than designed holes.   |
| Cleanout Gate         | Damaged or Missing                      | Cleanout gate is not watertight or is missing.  | Gate is watertight and works as designed.   |
|                       |   | Gate cannot be moved up and down by one maintenance person.                                 | Gate moves up and down easily and is watertight.  |
|                       |   | Chain/rod leading to gate is missing or damaged.  | Chain is in place and works as designed.  |
|                       |   | Gate is rusted over 50% of its surface area.  | Gate is repaired or replaced to meet design standards.  |
| Orifice Plate         | Damaged or Missing                      | Control device is not working properly due to missing, out of place, or bent orifice plate. | Plate is in place and works as designed.  |
|                       | Obstructions                            | Any trash, debris, sediment, or vegetation blocking the plate.                              | Plate is free of all obstructions and works as designed.  |
| Overflow Pipe         | Obstructions                            | Any trash or debris blocking (or having the potential of blocking) the overflow pipe.       | Pipe is free of all obstructions and works as designed.   |
| Manhole               | See "Closed Detention Systems" (No. 3). | See "Closed Detention Systems" (No. 3).   | See "Closed Detention Systems" (No. 3).   |
| Catch Basin           | See "Catch Basins" (No. 5).             | See "Catch Basins" (No. 5).   | See "Catch Basins" (No. 5).   |

### No. 5 – Catch Basins

| Maintenance Component        | Defect                        | Conditions When Maintenance is Needed  | Results Expected When Maintenance is performed                           |
|------------------------------|-------------------------------|--|--|
|                              | Contamination and Pollution   | See "Detention Ponds" (No. 1).   | No pollution present.  |
| Catch Basin Cover            | Cover Not in Place            | Cover is missing or only partially in place. Any open catch basin requires maintenance.  | Catch basin cover is closed  |
|                              | Locking Mechanism Not Working | Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.                            | Mechanism opens with proper tools.                                       |
|                              | Cover Difficult to Remove     | One maintenance person cannot remove lid after applying normal lifting pressure.<br><br>(Intent is keep cover from sealing off access to maintenance.) | Cover can be removed by one maintenance person.                          |
| Ladder                       | Ladder Rungs Unsafe           | Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.                                | Ladder meets design standards and allows maintenance person safe access. |
| Metal Grates (If Applicable) | Grate opening Unsafe          | Grate with opening wider than 7/8 inch.  | Grate opening meets design standards.                                    |
|                              | Trash and Debris              | Trash and debris that is blocking more than 20% of grate surface inletting capacity.   | Grate free of trash and debris.  |
|                              | Damaged or Missing.           | Grate missing or broken member(s) of the grate.  | Grate is in place and meets design standards.                            |

### No. 6 – Debris Barriers (e.g., Trash Racks)

| Maintenance Components | Defect                 | Condition When Maintenance is Needed   | Results Expected When Maintenance is Performed    |
|------------------------|------------------------|--|---|
| General                | Trash and Debris       | Trash or debris that is plugging more than 20% of the openings in the barrier. | Barrier cleared to design flow capacity.          |
| Metal                  | Damaged/ Missing Bars. | Bars are bent out of shape more than 3 inches.                                 | Bars in place with no bends more than 3/4 inch.   |
|                        |                        | Bars are missing or entire barrier missing.                                    | Bars in place according to design.                |
|                        |                        | Bars are loose and rust is causing 50% deterioration to any part of barrier.   | Barrier replaced or repaired to design standards. |
|                        | Inlet/Outlet Pipe      | Debris barrier missing or not attached to pipe                                 | Barrier firmly attached to pipe                   |

## No. 5 – Catch Basins

| Maintenance Component | Defect                                     | Conditions When Maintenance is Needed   | Results Expected When Maintenance is performed                                      |
|-----------------------|--|---|---|
| General               | Trash & Debris                             | Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.   | No Trash or debris located immediately in front of catch basin or on grate opening. |
|                       |  | Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. | No trash or debris in the catch basin.  |
|                       |  | Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.   | Inlet and outlet pipes free of trash or debris.                                     |
|                       |  | Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).  | No dead animals or vegetation present within the catch basin.                       |
|                       | Sediment                                   | Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.        | No sediment in the catch basin  |
|                       | Structure Damage to Frame and/or Top Slab  | Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch<br>(Intent is to make sure no material is running into basin).   | Top slab is free of holes and cracks.   |
|                       |  | Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached   | Frame is sitting flush on the riser rings or top slab and firmly attached.          |
|                       | Fractures or Cracks in Basin Walls/ Bottom | Maintenance person judges that structure is unsound.  | Basin replaced or repaired to design standards.                                     |
|                       |  | Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.   | Pipe is regouted and secure at basin wall.  |
|                       | Settlement/ Misalignment                   | If failure of basin has created a safety, function, or design problem.  | Basin replaced or repaired to design standards.                                     |
|                       | Vegetation                                 | Vegetation growing across and blocking more than 10% of the basin opening.  | No vegetation blocking opening to basin.  |
|                       |  | Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.  | No vegetation or root growth present.   |

**Envelope Summary** **Climate Zone 1** **ENV-SUM**

2006 Washington State Nonresidential Energy Code Compliance Forms

Revised July 2007

|                     |                    |  |                             |           |
|---------------------|--------------------|--|-----------------------------|-----------|
| <b>Project Info</b> | Project Address    | McDonald's Restaurant -2007 4587PP+5' Rear | Date                        | 5/13/2008 |
|                     |                    | 15210 Pacific Hwy. South                   | For Building Department Use |           |
|                     |                    | Tukwila, WA 98188                          |                             |           |
|                     | Applicant Name:    | Christopher K. Doerschlag, AIA             |                             |           |
|                     | Applicant Address: | 7007 Discovery Blvd. / Dublin, OH 43017    |                             |           |
|                     | Applicant Phone:   | 614-634-7000                               |                             |           |

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Permit No. \_\_\_\_\_

**Project Description**     New Building     Addition     Alteration     Change of Use

**Compliance Option**     Prescriptive     Component Performance     Seattle EnvStd.     Systems Analysis  
 (See Decision Flowchart (over) for qualifications)

**Space Heat Type**     Electric resistance     All other (see over for definitions)

**Glazing Area Calculation**  
 Note: Below grade walls may be included in the Gross Exterior Wall Area if they are insulated to the level required for opaque walls.

|  |  |            |                  |           |
|--|--|------------|------------------|-----------|
| Total Glazing Area (rough opening (vertical & overhd)) | Electronic version: these values are automatically taken from ENV-UA-1. Gross Exterior Wall Area | divided by | times 100 equals | % Glazing |
| 947.9  | 5463.9   | ÷          | X 100 =          | 17.3%     |

**Concrete/Masonry Option**     yes     no    Check here if using this option and if project meets all requirements for the Concrete/Masonry Option. See Decision Flowchart (over) for qualifications. Enter requirements for each qualifying assembly below.

**Semi-Heated Path**     yes     no    Check here if using semi-heated path and if project meets all requirements for semi-heated spaces as defined in section 1310. Requires other fuel heating and qualifying thermostat. Only wall insulation requirement is reduced (2006 change). Only available in prescriptive path.

**Envelope Requirements (enter values as applicable)**

| Minimum Insulation R-values     |      |
|---------------------------------|------|
| Roofs Over Attic                |      |
| All Other Roofs                 | R-30 |
| Opaque Walls <sup>1</sup>       | R-19 |
| Below Grade Walls               |      |
| Floors Over Unconditioned Space |      |
| Slabs-on-Grade                  |      |
| Radiant Floors                  |      |
| Maximum U-factors               |      |
| Opaque Doors                    |      |
| Vertical Glazing                |      |
| Overhead Glazing                |      |
| Maximum SHGC (or SC)            |      |
| Vertical/Overhead Glazing       |      |

**Opaque Concrete/Masonry Wall Requirements**

Wall Maximum U-factor is 0.15 (R5.7 continuous ins)

CMU block walls with insulated cores comply

If project qualifies for Concrete/Masonry Option, list walls with HC ≥ 9.0 Btu/ft<sup>2</sup>·°F below (other walls must meet Opaque Wall requirements). Use descriptions and values from Table 10-9 in the Code.

| Wall Description (including insulation R-value & position)  | U-factor |
|---|----------|
| <p><b>REVIEWED FOR CODE COMPLIANCE APPROVED</b></p> <p>AUG 11 2008</p> <p><i>[Signature]</i></p> <p>City of Tukwila BUILDING DIVISION</p> |          |
|   |          |
|   |          |
|   |          |
|   |          |
|   |          |
|   |          |
|   |          |
|   |          |

1. Assemblies with metal framing must comply with overall U-factors

Notes: 6729 REGISTERED ARCHITECT  
 Christopher K. Doerschlag  
 STATE OF WASHINGTON

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# Envelope UA Calculations

# Climate Zone 1

# ENV-UA

2006 Washington State Nonresidential Energy Code Compliance Forms

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|  |  |                             |
|--|--|-----------------------------|
| Project Address<br><b>McDonald's Restaurant -2007 4587PP+5' Rear</b> |  | Date<br><b>5/13/2008</b>    |
| Space Heat Type  | <input type="radio"/> Electric resistance <input checked="" type="radio"/> All other | For Building Department Use |
| Glazing Area as % gross exterior wall area                           | <b>17.3% Prop.</b> <b>45.0% Max.Target</b>   |                             |
| Concrete/Masonry Option  | <input type="radio"/> Yes <input checked="" type="radio"/> No                        |                             |

Notes: If glazing area exceeds maximum allowed in Table, then calculate adjusted areas on back (over).

| Building Component   |                           | Proposed UA |                |               | Target UA                                 |                 |               |
|--|---------------------------|-------------|----------------|---------------|---|-----------------|---------------|
| List components by assembly ID & page #  |                           | U-factor    | x Area (A)     | = UA (U x A)  | U-factor                                  | x Area (A)      | = UA (U x A)  |
| Vertical Glazing   | U= Plan ID <b>Windows</b> | 0.260       | 884.9          | 230.1         | 0.550                                     | 947.9           | 521.3         |
|  | U= Plan ID <b>Doors</b>   | 0.260       | 63.0           | 16.4          | Glazing %                                 | Electric Resist | Other Heating |
|  | U= Plan ID:               |             |                |               | 0-30%                                     | 0.40            | 0.55          |
|  | U= Plan ID:               |             |                |               | >30-45%                                   | see note above  | 0.45          |
|  | U= Plan ID:               |             |                |               |   |                 |               |
|  | U= Plan ID:               |             |                |               |   |                 |               |
| Overhead Glazing<br>Over Attics  | U= Plan ID:               |             |                |               | 0.700                                     |                 |               |
|  | U= Plan ID:               |             |                |               | Glazing %                                 | Electric Resist | Other Heating |
|  | U= Plan ID:               |             |                |               | 0-30%                                     | 0.6             | 0.7           |
|  | U= Plan ID:               |             |                |               | >30-45%                                   | see note above  | 0.6           |
|  | U= Plan ID:               |             |                |               |   |                 |               |
|  | U= Plan ID:               |             |                |               |   |                 |               |
| Opaque Doors   | U= Plan ID:               |             |                |               | 0.600                                     |                 |               |
|  | U= Plan ID:               |             |                |               |   | Electric Resist | Other Heating |
|  | U= Plan ID:               |             |                |               |   | 0.60            | 0.60          |
| Roofs Over Attics  | R= Plan ID:               | 0.030       | 5136.0         | 154.1         | 0.036                                     | 5136.0          | 184.9         |
|  | R= Plan ID:               |             |                |               |   | Electric Resist | Other Heating |
|  | R= Plan ID:               |             |                |               |   | 0.031           | 0.036         |
| Other Roofs  | R= Plan ID:               |             |                |               | 0.046                                     |                 |               |
|  | R= Plan ID:               |             |                |               |   | Electric Resist | Other Heating |
|  | R= Plan ID:               |             |                |               |   | 0.034           | 0.046         |
| Opaque Walls*  | R= Plan ID:               | 0.049       | 4516.0         | 221.3         | 0.050                                     | 4516.0          | 225.8         |
|  | R= Plan ID:               |             |                |               | **  |                 |               |
|  | R= Plan ID:               |             |                |               | **  |                 |               |
|  | R= Plan ID:               |             |                |               |   | Electric Resist | Other Heating |
|  | R= Plan ID:               |             |                |               | Frame-Wd                                  | 0.062           | 0.062         |
|  | R= Plan ID:               |             |                |               | Frame-Mtl                                 | 0.062           | 0.109         |
| **Note: sum of Target Areas here should equal Target Opaque Wall Area (see back)     |                           |             |                |               | Mass Wall                                 | 0.15            | 0.15          |
|  |                           |             |                |               | ** see mass wall Criteria                 |                 |               |
| Below Grade Walls  | R= Plan ID:               |             |                |               |   | Electric Resist | Other Heating |
|  | R= Plan ID:               |             |                |               | Int Ins                                   | 0.062           | 0.062         |
|  | R= Plan ID:               |             |                |               | Ext Ins                                   | 0.07            | 0.07          |
| Note: if insulated to levels required for opaque walls, list above with opaque walls |                           |             |                |               |   |                 |               |
| Roofs Over Inground  | R= Plan ID:               |             |                |               | 0.056                                     |                 |               |
|  | R= Plan ID:               |             |                |               |   | Electric Resist | Other Heating |
|  | R= Plan ID:               |             |                |               |   | 0.029           | 0.056         |
|  | R= Plan ID:               |             |                |               |   |                 |               |
| Below-grade Radiant  | R= Plan ID:               | 0.282       | 5136.0         | 1448.4        | 0.540                                     | 5136.0          | 2773.4        |
|  | R= Plan ID:               |             |                |               |   | Electric Resist | Other Heating |
|  | R= Plan ID:               |             |                |               |   | F=0.54          | F=0.54        |
|  | R= Plan ID:               |             |                |               | (see Table 13-1 for radiant floor values) |                 |               |
| *For CMU walls, indicate core insulation material.                                   |                           |             |                |               |   |                 |               |
| <b>Totals</b>  |                           |             | <b>15735.9</b> | <b>2070.2</b> | <b>Totals</b>                             | <b>15735.9</b>  | <b>3705.5</b> |

To comply: 1) Proposed Total UA shall not exceed Target Total UA.  
2) Proposed Total Area shall equal Target Total Area.

| Glazing<br>List components by assembly ID & page # | Proposed SHGC |              |              | Target SHGC   |                 |               |
|--|---------------|--------------|--------------|---------------|-----------------|---------------|
|  | SHGC*         | x Area (A)   | = SHGC x A   | SHGC          | x Area (A)      | = SHGC x A    |
| ID:  | 0.380         | 947.9        | 360.2        | 0.450         | 947.9           | 426.6         |
| ID:  |               |              |              | Glazing %     | Electric Resist | Other Heating |
| ID:  |               |              |              | 0-30%         | 0/4             | 0/45          |
| ID:  |               |              |              | >30-45%       | not allowed     | 0/4           |
| ID:  |               |              |              |               |                 |               |
| ID:  |               |              |              |               |                 |               |
| <b>Totals</b>                                      |               | <b>947.9</b> | <b>360.2</b> | <b>Totals</b> | <b>947.9</b>    | <b>426.6</b>  |

\*Note: Manufacturer's SC may be used in lieu of SHGC.

For compliance: Proposed total SHGC x A shall not exceed Target total SHGC x A

NOTE: Since 1997 SHGC compliance for vertical and overhead glazing is allowed to be calculated together.

### Target Area Adjustment Calculations

If the total amount of glazing area as a % of gross exterior wall area (calculated on ENV-SUM1) exceeds the maximum allowed in Table 13-1, then this calculation must be submitted. Use the resulting areas in the Target UA and SHGC calculations above.

Proposed Areas: Numbered values are used in calculations below.

|              | Roofs over Attics | Other Roofs | Walls     |
|--------------|-------------------|-------------|-----------|
| Glazing Area | OG=               | OG=         | VG= 947.9 |
| Opaque Area  | 5136.0            |             | 4516.0    |

Note: OG = overhead glazing, VG = vertical glazing

Gross Exterior Wall Area: 5463.9

Max Glazing Area (Table 13-1): 45.0%

Maximum Target Glazing Area: 2458.8

Calculation:  $5463.9 \times 45.0\% \div 100 = 2458.8$

Target OG Area in Roofs over Attics: 2458.8 (lesser)

Target OG Area in Other Roofs: 2458.8 (lesser)

Target VG Area: 947.9

|                   | Proposed Opaque Area | Proposed OG Area | Target OG Area | Target Opaque Area |
|-------------------|----------------------|------------------|----------------|--------------------|
| Roofs over Attics | 5136.0               |                  |                | 5136.0             |
| Other Roofs       |                      |                  |                |                    |

|       | Proposed Opaque Area | Proposed VG Area | Target VG Area | Target Opaque Area |
|-------|----------------------|------------------|----------------|--------------------|
| Walls | 4516.0               | 947.9            | 947.9          | 4516.0             |

Target Areas OK

Note: If there is more than one type of wall, the Target VG Area may be distributed among them, and separate Target Opaque Areas found. If the Target Areas for Opaque Walls listed on the front must equal the total calculated here.

Target values in shaded boxes are used in the applicable Target UA calculations on the front. Target VG Area and Total Target OG Area are also used in the applicable Target SHGC calculations above.

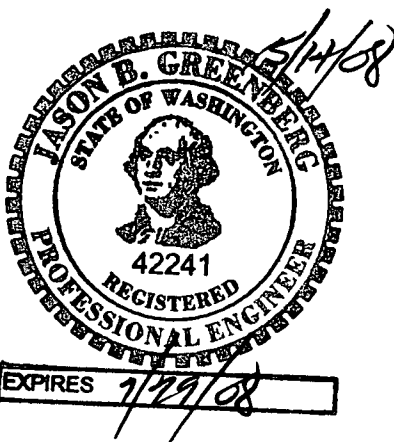
# Project Summary

**PRJ-SUM**

2006 Washington State Nonresidential Energy Code Compliance Forms

Revised July 2007

|                     |                    |  |                             |           |
|---------------------|--------------------|--|-----------------------------|-----------|
| <b>Project Info</b> | Project Address    | McDonald's Restaurant -2007 4587PP+5' Rear | Date                        | 5/13/2008 |
|                     |                    | 15210 Pacific Hwy. South                   | For Building Department Use |           |
|                     |                    | Tukwila, WA 98188                          |                             |           |
|                     | Applicant Name:    | Jason Greenberg, PE                        |                             |           |
|                     | Applicant Address: | 2111 McDonald's Dr., Oak Brook, IL         |                             |           |
|                     | Applicant Phone:   | 630-623-6917                               |                             |           |



# Mechanical Summary

# MECH-SUM

2006 Washington State Nonresidential Energy Code Compliance Forms

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|                     |                    |  |                        |           |
|---------------------|--------------------|--|------------------------|-----------|
| <b>Project Info</b> | Project Address    | McDonald's Restaurant -2007 4587PP+5' Rear | Date                   | 5/13/2008 |
|                     |                    | 15210 Pacific Hwy. South                   | For Building Dept. Use |           |
|                     |                    | Tukwila, WA 98188                          |                        |           |
|                     | Applicant Name:    | Jason Greenberg, PE                        |                        |           |
|                     | Applicant Address: | 2111 McDonald's Dr., Oak Brook, IL         |                        |           |
|                     | Applicant Phone:   | 630-623-6917                               |                        |           |

|   |   |
|---|---|
| <b>Project Description</b>                            |   |
| Briefly describe mechanical system type and features. |   |
| <input type="checkbox"/> Includes Plans               | Include documentation requiring compliance with commissioning requirements, Section 1416. |

|                          |   |
|--------------------------|---|
| <b>Compliance Option</b> | <input checked="" type="radio"/> Simple System <input type="radio"/> Complex System <input type="radio"/> Systems Analysis<br>(See Decision Flowchart (over) for qualifications. Use separate MECH-SUM for simple & complex systems.) |
|--------------------------|---|

|                            |  |
|----------------------------|--|
| <b>Equipment Schedules</b> | The following information is required to be incorporated with the mechanical equipment schedules on the plans. For projects without plans, fill in the required information below. |
|----------------------------|--|

| Cooling Equipment Schedule |                         |                        |                             |           |                   |             |                   |             |
|----------------------------|-------------------------|------------------------|-----------------------------|-----------|-------------------|-------------|-------------------|-------------|
| Equip. ID                  | Brand Name <sup>1</sup> | Model No. <sup>1</sup> | Capacity <sup>2</sup> Btu/h | Total CFM | OSA CFM or Econo? | SEER or EER | IPLV <sup>3</sup> | Location    |
| D-1                        | YORK                    | DH120N15P2B_M*         | 115000                      | 4000      | ECONO             | 11.00       | 11.70             | M1.0 & M3.0 |
| K-1                        | YORK                    | DH150N15Q2B_M*         | 146000                      | 5000      | ECONO             | 10.00       | 10.70             | M1.0 & M3.0 |
| K-2                        | YORK                    | D3HG048N07925_M*       | 46500                       | 1600      | ECONO             | 13.20       | 11.40             | M1.0 & M3.0 |
| P-1                        | YORK                    | DH090N15P2B_M*         | 89000                       | 3000      | ECONO             | 11.50       | 12.00             | M1.0 & M3.0 |
|                            |                         |                        |                             |           |                   |             |                   |             |
|                            |                         |                        |                             |           |                   |             |                   |             |

| Heating Equipment Schedule |                         |                        |                             |           |                   |            |             |                         |
|----------------------------|-------------------------|------------------------|-----------------------------|-----------|-------------------|------------|-------------|-------------------------|
| Equip. ID                  | Brand Name <sup>1</sup> | Model No. <sup>1</sup> | Capacity <sup>2</sup> Btu/h | Total CFM | OSA cfm or Econo? | Input Btuh | Output Btuh | Efficiency <sup>4</sup> |
| D-1                        | YORK                    | DH120N15P2B_M*         | 144000                      | 4000      | ECONO             | 180000     | 144000      | 0.800                   |
| K-1                        | YORK                    | DH150N15Q2B_M*         | 144000                      | 5000      | ECONO             | 180000     | 144000      | 0.800                   |
| K-2                        | YORK                    | D3HG048N07925_M*       | 80000                       | 1600      | ECONO             | 100000     | 80000       | 0.800                   |
| P-1                        | YORK                    | DH090N15P2B_M*         | 144000                      | 3000      | ECONO             | 180000     | 144000      | 0.800                   |
|                            |                         |                        |                             |           |                   |            |             |                         |
|                            |                         |                        |                             |           |                   |            |             |                         |

| Fan Equipment Schedule |                         |                        |      |                 |        |                           |                     |
|------------------------|-------------------------|------------------------|------|-----------------|--------|---------------------------|---------------------|
| Equip. ID              | Brand Name <sup>1</sup> | Model No. <sup>1</sup> | CFM  | SP <sup>1</sup> | HP/BHP | Flow Control <sup>5</sup> | Location of Service |
| D-1                    | YORK                    | DH120N15P2B_M*         | 4000 | 1.25            | 3.00   |                           |                     |
| K-1                    | YORK                    | DH150N15Q2B_M*         | 5000 | 1.40            | 5.00   |                           |                     |
| K-2                    | YORK                    | D3HG048N07925_M*       | 1600 | 0.50            | 1.00   |                           |                     |
| P-1                    | YORK                    | DH090N15P2B_M*         | 3000 | 0.65            | 1.50   |                           |                     |
|                        |                         |                        |      |                 |        |                           |                     |
|                        |                         |                        |      |                 |        |                           |                     |

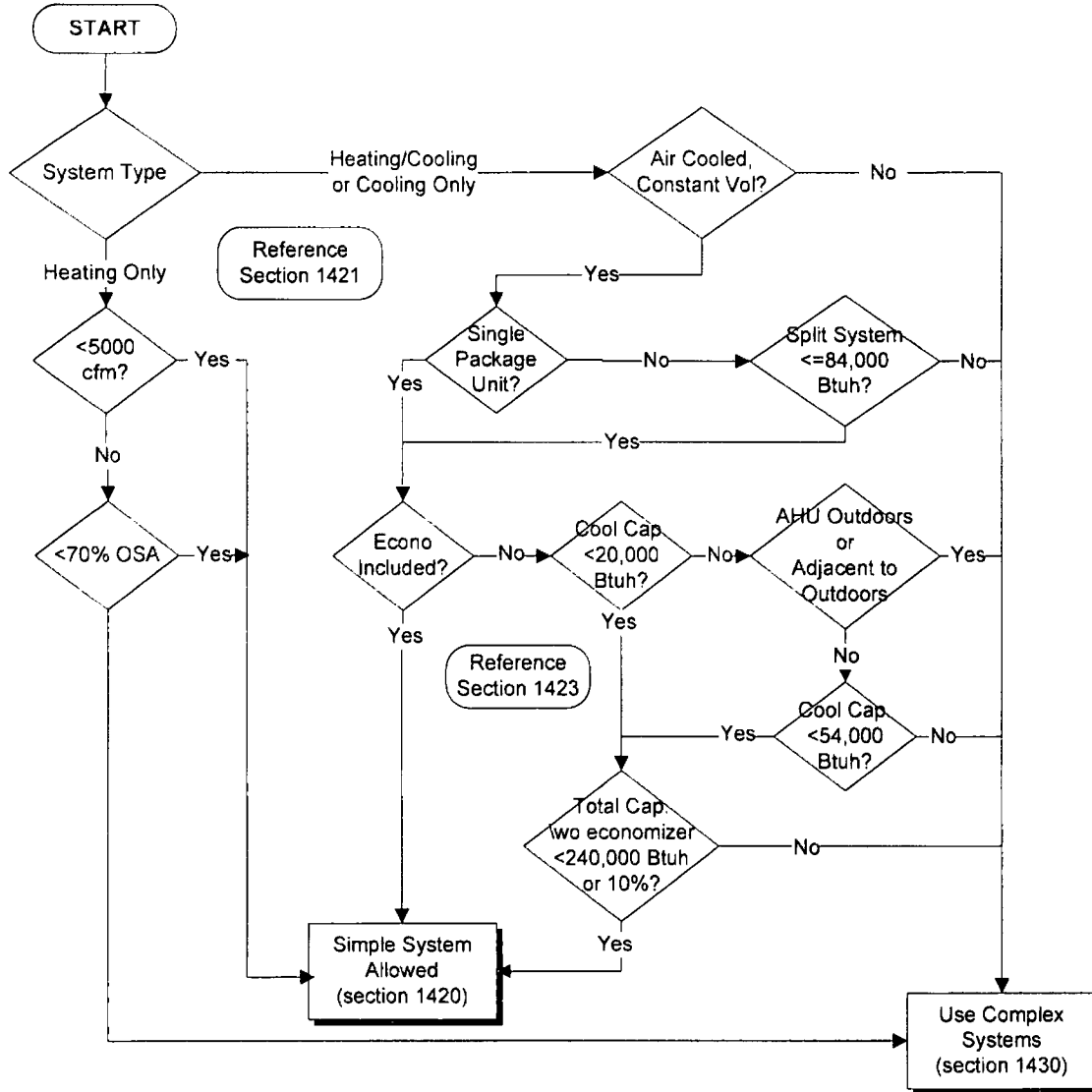
<sup>1</sup>If available.    <sup>2</sup> As tested according to Table 14-1A through 14-1G.    <sup>3</sup> If required.    <sup>4</sup> COP, HSPF, Combustion Efficiency, or AFUE, as applicable.    <sup>5</sup> Flow control types: variable air volume(VAV), constant volume (CV), or variable speed (VS).

# Mechanical Summary (back)

# MECH-SUM

|   |  |
|---|--|
| <b>System Description</b><br>See Section 1421 for full description of Simple System qualifications. | If Heating/Cooling or Cooling Only: <input checked="" type="checkbox"/> Constant vol? <input type="checkbox"/> Air cooled? <input checked="" type="checkbox"/> Packaged sys? <input checked="" type="checkbox"/> <20,000 Btuh? |
|   | <input type="checkbox"/> Split system? <input checked="" type="checkbox"/> Economizer included?  |
|   | If Heating Only: <input type="checkbox"/> <5000 cfm? <input type="checkbox"/> <70% outside air?  |

|                           |  |
|---------------------------|--|
| <b>Decision Flowchart</b> | Use this flowchart to determine if project qualifies for Simple System Option. If not, either the Complex System or Systems Analysis Options must be used. |
|---------------------------|--|



|                        |  |
|------------------------|--|
| <b>Complex Systems</b> | Refer to MECH-COMP Mechanical Complex Systems for assistance in determining which Complex Systems requirements are applicable to this project. |
|------------------------|--|

|  |                          |
|--|--------------------------|
| Project Address<br><b>McDonald's Restaurant -2007 4587PP+5' Rear</b> | Date<br><b>5/13/2008</b> |
|--|--------------------------|

The following information is necessary to check a mechanical permit application for compliance with the mechanical requirements in the Washington State Nonresidential Energy Code.

| Applicability<br>(yes, no, n.a.) | Code<br>Section | Component | Information Required | Location<br>on Plans | Building Department<br>Notes |
|----------------------------------|-----------------|-----------|----------------------|----------------------|------------------------------|
|----------------------------------|-----------------|-----------|----------------------|----------------------|------------------------------|

**HVAC REQUIREMENTS (Sections 1401-1424)**

|      | <b>1411</b> | <b>Equipment performance</b> |   |      |  |
|------|-------------|------------------------------|---|------|--|
| n.a. | 1411.4      | Pkg. elec. htg. & clg.       | List heat pumps on schedule                                     |      |  |
| yes  | 1411.1      | Minimum efficiency           | Equipment schedule with type, capacity, efficiency              | M3.0 |  |
| n.a. | 1411.1      | Combustion htg.              | Indicate intermittent ignition, flue/draft damper & jacket loss |      |  |

|      | <b>1412</b> | <b>HVAC controls</b> |  |            |  |
|------|-------------|----------------------|--|------------|--|
| yes  | 1412.1      | Temperature zones    | Indicate locations on plans                                  | M2.0       |  |
| yes  | 1412.2      | Deadband control     | Indicate 5 degree deadband minimum                           | M3.0       |  |
| n.a. | 1412.3      | Humidity control     | Indicate humidistat  |            |  |
| yes  | 1412.4      | Automatic setback    | Indicate thermostat with night setback and 7 diff. day types | M3.0       |  |
| yes  | 1412.4.1    | Dampers              | Indicate damper location and auto. controls & max. leakage   | M2.0, M3.0 |  |
| n.a. | 1412.4.2    | Optimum Start        | Indicate optimum start controls                              |            |  |
| n.a. | 1412.5      | Heat pump control    | Indicate microprocessor on thermostat schedule               |            |  |
| yes  | 1412.6      | Combustion htg.      | Indicate modulating or staged control                        | M3.0       |  |
| yes  | 1412.7      | Balancing            | Indicate balancing features on plans                         | M2.0       |  |
|      | 1412.8      | Ventilation Control  | Indicate demand control ventilation for high-occupancy areas | M3.0       |  |
| yes  | 1422        | Thermostat interlock | Indicate thermostat interlock on plans                       | M2.0       |  |
| yes  | 1423        | Economizers          | Equipment schedule   | M3.0       |  |

|      | <b>1413</b> | <b>Air economizers</b> |   |      |  |
|------|-------------|------------------------|---|------|--|
| yes  | 1413.1      | Air Econo Operation    | Indicate 100% capability on schedule                      | M3.0 |  |
| yes  | 1413.1      | Wtr Econo Operation    | Indicate 100% capacity at 45 degF db & 40 deg F wb        | M3.0 |  |
| yes  | 1413.2      | Water Econo Doc        | Indicate clg load & water econoe & clg tower performance  | M3.0 |  |
| n.a. | 1413.3      | Integrated operation   | Indicate capability for partial cooling                   |      |  |
| n.a. | 1413.4      | Humidification         | Indicate direct evap or fog atomization w/ air economizer |      |  |

|     | <b>1414</b> | <b>Ducting systems</b> |  |      |  |
|-----|-------------|------------------------|--|------|--|
| yes | 1414.1      | Duct sealing           | Indicate sealing necessary               | M3.0 |  |
| yes | 1414.2      | Duct insulation        | Indicate R-value of insulation on duct   | M2.0 |  |
| yes | 1415.1      | Piping insulation      | Indicate R-value of insulation on piping | SPEC |  |

|      | <b>1416</b> | <b>Completion Requirements</b> |  |      |  |
|------|-------------|--------------------------------|--|------|--|
| yes  | 1416.2.1    | Commissioning                  | Provide commissioning plan   | M2.0 |  |
| yes  | 1416.2.2-3  | Sys.Bal & Func.Test            | Indicate air and water system balancing & functional testing   | M0.0 |  |
| n.a. | 1416.2.4    | Commissioning                  | Indicate O&M manuals, record drawings, staff training  |      |  |
| n.a. | 1416.2.5    | Comm. Report                   | Indicate requirements for prelim. & final commissioning report                                       |      |  |
| n.a. | 1434        | Separate air sys.              | Indicate separate systems on plans   |      |  |
| yes  |             | <b>Mechanical Summary Form</b> | Completed and attached. Equipment schedule with types, input/output, efficiency, cfm, hp, economizer | M1.0 |  |

**SERVICE WATER HEATING AND HEATED POOLS (Sections 1440-1454)**

|  | <b>1440</b> | <b>Service water htg.</b> |  |  |  |
|--|-------------|---------------------------|--|--|--|
|  | 1441        | Elec. water heater        | Indicate R-10 insulation under tank      |  |  |
|  | 1442        | Shut-off controls         | Indicate automatic shut-off              |  |  |
|  | 1443        | Pipe Insulation           | Indicate R-value of insulation on piping |  |  |
|  | 1452        | Heat Pump COP             | Indicate minimum COP of 4.0              |  |  |
|  | 1452        | Heater Efficiency         | Indicate pool heater efficiency          |  |  |
|  | 1453        | Pool heater controls      | Indicate switch and 65 degree control    |  |  |
|  | 1454        | Pool covers               | Indicate vapor retardant cover           |  |  |
|  | 1454        | Pools 90+ degrees         | Indicate R-12 pool cover                 |  |  |

**If "no" is circled for any question, provide explanation:**



**Mechanical Permit Plans Checklist****MECH-CHK**

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Revised July 2007

**Mechanical - General Requirements**

**1411.1 General:** Equipment shall have a minimum performance at the specified rating conditions not less than the values shown in Table 14-1A through 14-1G. If a nationally recognized certification program exists for a product covered in Tables 14-1A through 14-1G, and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be listed in the certification program.

Gas-fired and oil-fired forced air furnaces with input ratings  $\geq 225,000$  Btu/h (65 kW) and all unit heaters shall also have an intermittent ignition or interrupted device (IID), and have either mechanical draft (including power venting) or a flue damper. A vent damper is an acceptable alternative to a flue damper for furnaces where combustion air is drawn from the conditioned space. All furnaces with input ratings  $\geq 225,000$  Btu/h (65 kW), including electric furnaces, that are not located within the conditioned space shall have jacket losses not exceeding 0.75% of the input rating.

**1411.2 Rating Conditions:** Cooling equipment shall be rated at ARI test conditions and procedures when available. Where no applicable procedures exist, data shall be furnished by the equipment manufacturer.

**1411.3 Combination Space and Service Water Heating:** For combination space and service water heaters with a principal function of providing space heat, the Combined Annual Efficiency (CAE) may be calculated by using ASHRAE Standard 124-1991. Storage water heaters used in combination space heat and water heat applications shall have either an Energy Factor (EF) or a CAE of not less than the following:

|                      | EF   | CAE  |
|----------------------|------|------|
| < 50 gal storage     | 0.58 | 0.71 |
| 50 to 70 gal storage | 0.57 | 0.71 |
| > 70 gal storage     | 0.55 | 0.70 |

**1411.4 Packaged Electric Heating and Cooling Equipment:** Packaged electric equipment providing both heating and cooling with a total cooling capacity greater than 20, Btu/h shall be a heat pump.

**Exception:** Unstaffed equipment shelters or cabinets used solely for personal wireless service facilities.

**1412 Controls**

**1412.1 Temperature Controls:** Each system shall be provided with at least one temperature control device. Each zone shall be controlled by individual thermostatic controls responding to temperature within the zone. At a minimum, each floor of a building shall be considered as a separate zone.

**1412.2 Deadband Controls:** When used to control both comfort heating and cooling, zone thermostatic controls shall be capable of a deadband of at least 5 degrees F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

**Exceptions:**

1. Special occupancy, special usage, or code requirements where deadband controls are not appropriate.
2. Buildings complying with Section 114.1.4, if in the proposed building energy analysis, heating and cooling thermostat setpoints are set to the same temperature between 70 degrees F and 75 degrees F inclusive, and assumed to be constant throughout the year.
3. Thermostats that require manual changeover between heating and cooling modes.

**1412.3 Humidity Controls:** If a system is equipped with a means for adding moisture, a humidistat shall be provided.

**1412.4 Setback and Shut-Off:** HVAC systems shall be equipped with automatic controls capable of accomplishing a reduction of energy use through control setback or equipment shutdown during periods of non-use or alternate use of the spaces served by the system. The automatic controls shall have a minimum seven-day clock and be capable of being set for seven different day types per week. It must retain programming and time for a power loss of 10 hours and include an accessible manual override of up to 2 hours.

**Exceptions:**

1. Systems serving areas which require continuous operation at the same temperature setpoint.
2. Equipment with full load demands of 2 kW (6,826 Btu/h) or less may be controlled by readily accessible manual off-hour controls.
3. Systems controlled by an occupant sensor that is capable of shutting the system off when no occupant is sensed for a period of up to 30 minutes.
4. Systems controlled solely by a manually operated timer capable of operating the system for no more than two hours.

**1412.4.1 Dampers:** Outside air intakes, exhaust outlets and relief outlets serving conditioned spaces shall be equipped with dampers which close automatically when the system is off or upon power failure. Stair shaft and elevator shaft smoke relief openings shall be equipped with normally open (fails to open upon loss of power) dampers. These dampers shall remain closed until activated by the fire alarm system or other approved smoke detection system.

**Exceptions:**

1. Systems serving areas which require continuous operation.
2. Combustion air intakes
3. Gravity (nonmotorized) dampers are acceptable in buildings less than 3 stories in height.
4. Gravity (nonmotorized) dampers are acceptable in exhaust and relief outlets in the first story and levels below the first story of buildings

**1412.8 Ventilation Controls for High-Occupancy Areas:** Demand control ventilation (DCV) is required for spaces that are larger than 500 ft<sup>2</sup>, have a design occupancy for ventilation of greater than 40 people for 1000 ft<sup>2</sup> of floor area, and are served by systems with one or more of the following.

- a. An air-side economizer,
- b. Automatic modulating control of the outdoor air damper, or
- c. A design outdoor airflow greater than 3000 cfm.

**Exceptions:**

1. Systems with energy recovery complying with Section 1436.
2. Multiple-zone systems without direct-digital control of individual zones communicating with a central control panel.
3. Systems with a design outdoor airflow less than 1200 cfm.
4. Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1200 cfm.

**1413 Air Economizers**

**1413.1 Operation:** Air economizers shall be of automatically modulating outside and return air dampers to provide 100 percent of the design supply air as outside air to reduce or eliminate the need for mechanical cooling. Water economizers shall be capable of providing the total concurrent cooling load served by the connected terminal equipment lacking airside economizer, at outside air temperatures of 45°F dry-bulb/40°F wet-bulb and below. For this calculation, all factors including solar and internal load shall be the same as those used for peak load calculations, except for the outside temperatures.

**Exception:** Water economizers using air-cooled heat rejection equipment may use a 35°F dry-bulb outside air temperature for this calculation. This exception is limited to a maximum of 20 tons per building.

**1413.2 Documentation:** Water economizer plans submitted for approval shall include the following information:

1. Maximum outside air conditions for which economizer is sized to provide full cooling.
2. Design cooling load to be provided by economizer at this outside air condition.
3. Heat rejection and terminal equipment performance data including model number, flow rate, capacity, entering and leaving temperature in full economizer cooling mode.

**1413.3 Integrated Operation:** Air economizers shall be capable of providing partial cooling even when additional mechanical cooling is required to meet the remainder of the cooling load.

**Exceptions:**

1. Individual, direct expansion units that have a rated capacity less than 65,000 Btu/h and use nonintegrated economizer controls that preclude simultaneous operation of the economizer and mechanical cooling.
2. Water-cooled water chillers with waterside economizer.

**1413.4 Humidification:** If an air economizer is required on a cooling system for which humidification equipment is to be provided to maintain minimum indoor humidity levels, then the humidifier shall be of the adiabatic type (direct evaporative media or fog atomization type).

**Exceptions:**

1. Health care facilities where WAC 246-320-525 allows only steam injection humidifiers in ductwork downstream of final filters.
- 1412.6 Combustion Heating Equipment Controls: Combustion heating equipment with a capacity over 225,000 Btu/h shall have modulating or staged combustion control.
2. Systems with water economizer
3. 100% outside air systems with no provisions for air recirculation to the central supply fan.
4. Nonadiabatic humidifiers cumulatively serving no more than 10% of a building's air economizer capacity as measured in cfm. This refers to the system cfm serving rooms with stand alone or duct mounted humidifiers.

**1414 Ducting Systems**

**1414.1 Sealing:** Duct work which is designed to operate at pressures above 1/2 inch water column static pressure shall be sealed in accordance with Standard RS-18. Extent of sealing required is as follows:

1. Static pressure: 1/2 inch to 2 inches; seal transverse joints.
2. Static pressure: 2 inches to 3 inches; seal all transverse joints and longitudinal seams.
3. Static pressure: above 3 inches; seal all transverse joints, longitudinal seams and duct wall penetrations.

Duct tape and other pressure sensitive tape shall not be used as the primary sealant where ducts are designed to operate at static pressures of 1 inch W.C. or greater.

**1414.2 Insulation:** Ducts and plenums that are constructed and function as part of the building envelope, by separating interior space from exterior space, shall meet all applicable requirements of Chapter 13. These requirements include insulation installation, moisture control, air leakage, and building envelope insulation levels. Unheated equipment rooms with combustion air louvers must be isolated from the conditioned space by insulating interior surfaces to a minimum of R-11 and any exterior envelope surfaces per Chapter 13. Outside air ducts serving individual supply air units with less than 2,800 cfm of total supply air capacity shall be insulated to a minimum of R-7 and are not considered building envelope. Other outside air duct runs are considered building envelope until they.

outlets in the first story and levels below the first story of buildings three or more stories in height.

**1412.4.2 Optimum Start Controls:** Heating and cooling systems with design supply air capacities exceeding 10,000 cfm shall have optimum start controls. Optimum start controls shall be designed to automatically adjust the start time of an HVAC system each day to bring the space to desired occupied temperature levels immediately before scheduled occupancy. The control algorithm shall, as a minimum, be a function of the difference between space temperature and occupied setpoint and the amount of time prior to scheduled occupancy.

**1412.5 Heat Pump Controls:** Unitary air cooled heat pumps shall include microprocessor controls that minimize supplemental heat usage during start-up, set-up, and defrost conditions. These controls shall anticipate need for heat and use compression heating as the first stage of heat. Controls shall indicate when supplemental heating is being used through visual means (e.g., LED indicators).

**1412.6 Combustion Heating Equipment Controls:** Combustion heating equipment with a capacity over 225,000 Btu/h shall have modulating or staged combustion control. 000

EXCEPTIONS. 1. Boilers. 2. Radiant heaters.

**1412.7 Balancing:** Each air supply outlet or air or water terminal device shall have a means for balancing, including but not limited to, dampers, temperature and pressure test connections and balancing valves.

duct runs are considered building envelope until they,

1. connect to the heating or cooling equipment, or
2. are isolated from the exterior with an automatic shut-off damper complying with Section 1412.4.1.

Once outside air ducts meet the above listed requirements, any runs within conditioned space shall comply with Table 14-5 requirements.

Other ducts and plenums shall be thermally insulated per Table 14-5.

**Exceptions:**

1. Within the HVAC equipment.
2. Exhaust air ducts not subject to condensation
3. Exposed ductwork within a zone that serves that zone.

**1415 Piping Systems**

**1415.1 Insulation:** Piping shall be thermally insulated in accordance with Table 14-6

**Exception:** Piping installed within unitary HVAC equipment.

Water pipes outside the conditioned space shall be insulated in accordance with Washington State Plumbing Code (WAC 51-26)

**1416 Completion Requirements** (Refer to NREC Section 1416 and the Building Commissioning Guidelines, published by the Building Commissioning Association, for complete text and guidelines for building completion and commissioning requirements )

# Interior Lighting Summary

**LTG-INT**

2006 Washington State Nonresidential Energy Code Compliance Forms

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|                     |                    |   |                             |           |
|---------------------|--------------------|---|-----------------------------|-----------|
| <b>Project Info</b> | Project Address    | McDonald's Restaurant                     | Date                        | 5/13/2008 |
|                     |                    | 15210 Pacific Highway West                | For Building Department Use |           |
|                     |                    | Tukwila, Wa                               |                             |           |
|                     | Applicant Name:    | Mike Slikas                               |                             |           |
|                     | Applicant Address: | 2111 McDonald's Drive, Oak Brook IL 60523 |                             |           |
|                     | Applicant Phone:   | (630) 6232389                             |                             |           |

|                            |   |
|----------------------------|---|
| <b>Project Description</b> | <input checked="" type="checkbox"/> New Building <input type="checkbox"/> Addition <input type="checkbox"/> Alteration <input type="checkbox"/> Plans Included<br>Refer to WSEC Section 1513 for controls and commissioning requirements. |
|----------------------------|---|

|                          |   |
|--------------------------|---|
| <b>Compliance Option</b> | <input type="checkbox"/> Prescriptive <input checked="" type="radio"/> Lighting Power Allowance <input type="checkbox"/> Systems Analysis<br>(See Qualification Checklist (over). Indicate Prescriptive & LPA spaces clearly on plans.) |
|--------------------------|---|

|   |   |
|---|---|
| <b>Alteration Exceptions</b><br>(check appropriate box - sec. 1132.3) | <input type="checkbox"/> No changes are being made to the lighting<br><input type="checkbox"/> Less than 60% of the fixtures new, installed wattage not increased, & space use not changed. |
|---|---|

## Maximum Allowed Lighting Wattage

| Location (floor/room no.) | Occupancy Description                           | Allowed Watts per ft <sup>2</sup> ** | Area in ft <sup>2</sup> | Allowed x Area |
|---------------------------|---|--------------------------------------|-------------------------|----------------|
|                           | Fast Food Establishment (Sec 1531 & Table 15.1) | 1.50                                 | 5483.0                  | 8224.5         |
| Total Allowed Watts       |   |                                      |                         | 8224.5         |

\*\* From Table 15-1 (over) - document all exceptions on form LTG-LPA

## Proposed Lighting Wattage

| Location (floor/room no.)  | Fixture Description | Number of Fixtures | Watts/Fixture | Watts Proposed |
|--|---------------------|--------------------|---------------|----------------|
| room no. 104, 105, 106, 108, 109 & 118                               | F2                  | 39                 | 98.0          | 3822.0         |
| room no. 105   | F7                  | 2                  | 51.0          | 102.0          |
| room no. 101, 102, 103, 117  | F12/12A             | 62                 | 43.0          | 2666.0         |
| room no. 100   | F13                 | 15                 | 43.0          | 645.0          |
| room no. 100   | F1                  | 8                  | 60.0          | 480.0          |
| room no. 112, 113, 114   | F26                 | 3                  | 60.0          | 180.0          |
| room no. 101   | MP1                 | 2                  | 75.0          | 150.0          |
| Total Proposed Watts may not exceed Total Allowed Watts for Interior |                     |                    |               | 8045.0         |

**Notes:**

- For proposed Fixture Description, indicate fixture type, lamp type (e.g. T-8), number of lamps in the fixture, and ballast type (if included). For track lighting, list the length of the track (in feet) in addition to the fixture, lamp, and ballast information.
- For proposed Watts/Fixture, use manufacturer's listed maximum input wattage of the fixture (not supply the lamp wattage) and other criteria as specified in Section 1530. For hard-wired ballasts only, the default table in the WSEC Technical Reference Manual may also be used. For track lighting, list the greater of actual luminaire wattage or length of fixture times wattage per foot, if applicable, the wattage of current limiting devices or of the transformer.
- List all fixtures. For exempt lighting, note section and exception number, and leave Watts/fixture blank.

Michael P. Slikas  
 5/14/08  
 EXPIRES 2/10/09

# Interior Lighting Summary (back)

**LTG-INT**

2006 Washington State Nonresidential Energy Code Compliance Forms

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|  |  |
|--|--|
| <b>Prescriptive Spaces</b>   | Occupancy: <input type="radio"/> Warehouses, storage areas or aircraft storage hangers <input type="radio"/> Other   |
| <b>Qualification Checklist</b><br>Note: If occupancy type is "Other" and fixture answer is checked, the number of fixtures in the space is not limited by Code. Clearly indicate these spaces on plans. If not qualified, do LPA Calculations. | Lighting Fixtures: (Section 1521) <input type="checkbox"/> Check if 95% or more of fixtures comply with 1,2 or 3 and rest are ballasted.<br>1. Fluorescent fixtures which are non-lensed with a) 1 or 2 two lamps, b) reflector or louvers, c) 5-60 watt T-1, T-2, T-4, T-5, T-8 lamps, and d) hard-wired electronic dimming ballasts. Screw-in compact fluorescent fixtures do not qualify.<br>2. Metal Halide with a) reflector b) ceramic MH lamps <= 150w c) electronic ballasts<br>3. LED lights. |

**TABLE 15-1 Unit Lighting Power Allowance (LPA)**

| Use <sup>1</sup>  | LPA <sup>2</sup> (W/sf) | Use <sup>1</sup>   | LPA <sup>2</sup> (W/sf) |
|---|-------------------------|--|-------------------------|
| Automotive facility   | 0.9                     | Office buildings, office/administrative areas in facilities of other use types (including but not limited to schools, hospitals, institutions, museums, banks, churches) <sup>5,7,11</sup> | 1.0                     |
| Convention center   | 1.2                     | Penitentiary and other Group I-3 Occupancies   | 1.0                     |
| Courthouse  | 1.2                     | Police and fire stations <sup>5</sup>  | 1.0                     |
| Cafeterias, fast food establishments <sup>5</sup> , restaurants/bars <sup>5</sup>                             | 1.3                     | Post office  | 1.1                     |
| Dormitory   | 1.0                     | Retail <sup>10</sup> , retail banking, mall concourses, wholesale stores (pallet rack shelving)  | 1.5                     |
| Exercise center   | 1.0                     | School buildings (Group E Occupancy only), school classrooms, day care centers   | 1.2                     |
| Gymnasia <sup>9</sup> , assembly spaces <sup>9</sup>  | 1.0                     | Theater, motion picture  | 1.2                     |
| Health care clinic  | 1.0                     | Theater, performing arts   | 1.6                     |
| Hospital, nursing homes, and other Group I-1 and I-2 Occupancies  | 1.2                     | Transportation   | 1.0                     |
| Hotel/motel   | 1.0                     | Warehouses <sup>11</sup> , storage areas   | 0.5                     |
| Hotel banquet/conference/exhibition hall <sup>3,4</sup>   | 2.0                     | Workshops  | 1.4                     |
| Laboratory spaces (all spaces not classified "laboratory" shall meet office and other appropriate categories) | 1.8                     | Parking garages  | 0.2                     |
| Laundries   | 1.2                     |  |                         |
| Libraries <sup>5</sup>  | 1.3                     | <b>Plans Submitted for Common Areas Only</b>   |                         |
| Manufacturing facility  | 1.3                     | Main floor building lobbies <sup>9</sup> (except mall concourses)  | 1.2                     |
| Museum  | 1.1                     | Common areas, corridors, toilet facilities and washrooms, elevator lobbies   | 0.8                     |

**Footnotes for Table 15-1**

- 1) In cases in which a general use and a specific use are listed, the specific use shall apply. In cases in which a use is not mentioned specifically, the Unit Power Allowance shall be determined by the building official. This determination shall be based upon the most comparable use specified in the table. See Section 1512 for exempt areas.
- 2) The watts per square foot may be increased, by two percent per foot of ceiling height above twenty feet, unless specifically directed otherwise by subsequent footnotes.
- 3) Watts per square foot of room may be increased by two percent per foot of ceiling height above twelve feet.
- 4) For all other spaces, such as seating and common areas, use the Unit Light Power Allowance for assembly.
- 5) Watts per square foot of room may be increased by two percent per foot of ceiling height above nine feet.
- 6) Reserved.
- 7) For conference rooms and offices less than 150ft<sup>2</sup> with full height partitions, a Unit Lighting Power Allowance of 1.10 w/ft<sup>2</sup> may be used.
- 8) Reserved.
- 9) For indoor sport tournament courts with adjacent spectator seating over 5,000, the *Unit Lighting Power Allowance* for the court area is 2.60 W/ft<sup>2</sup>.
- 10) Display window illumination installed within 2 feet of the window, provided that the display window is separated from the retail space by walls or at least three-quarter-height partitions (transparent or opaque), and lighting for free-standing display where the lighting moves with the display are exempt.  
 An additional 1.5 w/ft<sup>2</sup> of merchandise display luminaires are exempt provided that they comply with all three of the following:
  - a) located on ceiling-mounted track or directly on or recessed into the ceiling itself (not on the wall).
  - b) adjustable in both the horizontal and vertical axes (vertical axis only is acceptable for fluorescent and other fixtures with two points of track attachment).
  - c) fitted with LED, tungsten halogen, fluorescent, or high intensity discharge lamps.
 This additional lighting power is allowed only if the lighting is actually installed.
- 11) Provided that a floor plan, indicating rack location and height, is submitted, the square footage for a warehouse may be defined, for computing the interior Unit Lighting Power Allowance, as the floor area not covered by racks plus the vertical face area (access side only) of the racks. The height allowance defined in footnote 2 applies only to the floor area not covered by racks.

**Exterior Lighting Summary****LTG-EXT**

2006 Washington State Nonresidential Energy Code Compliance Forms

Revised July 2007

|                                  |   |                             |
|----------------------------------|---|-----------------------------|
| <b>Project Info</b>              | Proj Address: <b>McDonald's Restaurant</b>                  | Date: <b>5/13/2008</b>      |
|                                  | <b>15210 Pacific Highway West</b>                           | For Building Department Use |
|                                  | <b>Tukwila, Wa</b>  |                             |
|                                  | Name: <b>Mike Slikas</b>                                    |                             |
|                                  | Appl. Name <b>2111 McDonald's Drive, Oak Brook IL 60523</b> |                             |
| Appl. Phone <b>(630) 6232389</b> |   |                             |

|                            |  |
|----------------------------|--|
| <b>Project Description</b> | <input checked="" type="checkbox"/> New <input type="checkbox"/> Addition <input type="checkbox"/> Alteration <input type="checkbox"/> Plans Included<br>Refer to WSEC Section 1513 for controls and commissioning requirements. |
|----------------------------|--|

|                          |  |
|--------------------------|--|
| <b>Compliance Option</b> | <input checked="" type="radio"/> Lighting Power Allowance <input type="radio"/> Systems Analysis |
|--------------------------|--|

|   |   |
|---|---|
| <b>Building Grounds</b><br>(luminaires > 100 Watts) | <input type="checkbox"/> Efficacy > 60 lumens/W <input type="checkbox"/> Controlled by motion Sensor<br><input type="checkbox"/> Exemption (list) _____ |
|---|---|

|   |   |
|---|---|
| <b>Alteration Exceptions</b><br>(check appropriate box - sec. 1132.3) | <input type="checkbox"/> No changes are being made to the lighting<br><input type="checkbox"/> Less than 60% of the fixtures new, installed wattage not increased, & space use not changed. |
|---|---|

**Tradable Maximum Allowed Lighting Wattage**

| Tradable Locations        | Description | Allowed Watts per ft <sup>2</sup> or per lf | Area (ft <sup>2</sup> ), perimeter (lf) or # of items | Allowed Watts x ft <sup>2</sup> (or x lf) |
|---------------------------|-------------|---|---|---|
| Main Entry                |             | 30 W/LF of door width                       | 4.5   | 135.0                                     |
| Main Entry                |             | 30 W/LF of door width                       | 4.5   | 135.0                                     |
| Other Entries             |             | 20 W/LF of door width                       | 4.5   | 90.0                                      |
| Grounds Walkways <10 wide |             | 1.0 W/LF                                    | 123.0   | 123.0                                     |
| Canopies and Overhangs    |             | 1.25 W/ft <sup>2</sup>                      | 560.0   | 700.0                                     |
| Other Entries             |             | 20 W/LF of door width                       | 4.5   | 90.0                                      |
| Total Allowed Watts       |             |   |   | 1273.0                                    |

Use mfg listed maximum input wattage. For fixtures with hard-wired ballasts only, the default table in the NREC Technical Reference Manual may also be used.

**Tradable Proposed Lighting Wattage**

| Location   | Fixture Description | Number of Fixtures | Watts/ Fixture | Watts Proposed       |
|--|---------------------|--------------------|----------------|----------------------|
| Main Entry points  | Radial wall sconce  | 2                  | 120.0          | 240.0                |
| Front and side of restaurant   | Well lights         | 9                  | 84.0           | 756.0                |
| Other Entry points   | Radial wall sconce  | 2                  | 120.0          | 240.0                |
| Total Proposed Watts may not exceed Total Allowed Watts for Exterior |                     |                    |                | Total Proposed Watts |
|  |                     |                    |                | 1236.0               |

**Non-Tradable Maximum Allowed Lighting Wattage**

| Non-Tradable Locations  | Description | Allowed Watts per ft <sup>2</sup> or per lf | Area (ft <sup>2</sup> ), perimeter (lf) or # of items | Allowed Watts x ft <sup>2</sup> (or x lf) |
|-------------------------|-------------|---|---|---|
| Fast Food Drive up      |             | 400W per driveup                            | 2.0   | 800.0                                     |
| Bldg. Façade (by perim) |             | 5.0 W/lf                                    | 82.0  | 410.0                                     |
|                         |             |   |   |   |

**Non-Tradable Proposed Lighting Wattage**

| Location                | Fixture Description     | Number of Fixtures | Watts/ Fixture | Watts Proposed |
|-------------------------|-------------------------|--------------------|----------------|----------------|
| Fast Food Drive up      | Radial wall sconce      | 4                  | 120.0          | 480.0          |
| Bldg. Façade (by perim) | Back side of restaurant | 3                  | 120.0          | 360.0          |
|                         |                         |                    |                |                |

Proposed Watts may not exceed Allowed Watts for Category

**Exterior Lighting Summary (back)****LTG-EXT**

2006 Washington State Nonresidential Energy Code Compliance Forms

Revised July 2007

**TABLE 15-2  
LIGHTING POWER DENSITIES FOR BUILDING EXTERIORS**

|  |  |  |
|--|--|--|
| <b>Tradable Surfaces</b><br>(Lighting power densities for uncovered parking areas, building grounds, building entrances and exits, canopies and overhangs and outdoor sales areas may be traded.)  | <b>Uncovered Parking Areas</b>   |  |
|  | Parking lots and drives  | 0.15 W/ft <sup>2</sup>   |
|  | <b>Building Grounds</b>  |  |
|  | Walkways less than 10 feet wide  | 1.0 W/linear foot  |
|  | Walkways 10 feet wide or greater<br>Plaza areas<br>Special feature areas                       | 0.2W/ft <sup>2</sup>   |
|  | Stairways  | 1.0 W/ft <sup>2</sup>  |
|  | <b>Building Entrances and Exits</b>  |  |
|  | Main entries   | 30 W/linear foot of door width   |
|  | Other doors  | 20 W/linear foot of door width   |
|  | <b>Canopies and Overhangs</b>  |  |
|  | Canopies (free standing and attached and overhangs)  | 1.25 W/ft <sup>2</sup>   |
|  | <b>Outdoor Sales</b>   |  |
|  | Open areas (including vehicle sales lots)  | 0.5 W/ft <sup>2</sup>  |
|  | Street frontage for vehicle sales lots in addition to "open area" allowance                    | 20 W/linear foot   |
| <b>Non-Tradable Surfaces</b> (Lighting power density calculations for the following applications can be used only for the specific application and cannot be traded between surfaces or with other exterior lighting. The following allowances are in addition to any allowance otherwise permitted in the "Tradable Surfaces" section of this table.) | <b>Building Facades</b>  |  |
|  |  | 0.2 W/ft <sup>2</sup> for each illuminated wall or surface or 5.0W/linear foot for each illuminated wall or surface length           |
|  | <b>Automated teller machines and night depositories</b>  | 270 W per location plus 90 W per additional ATM per location   |
|  | <b>Entrances and gatehouse inspection stations at guarded facilities</b>                       | 1.25 W/ft <sup>2</sup> of uncovered area (covered areas are included in the "Canopies and Overhangs" section of "Tradable Surfaces") |
|  | <b>Loading areas for law enforcement, fire, ambulance and other emergency service vehicles</b> | 0.5 W/ft <sup>2</sup> of uncovered area (covered areas are included in the "Canopies and Overhangs" section of "Tradable Surfaces")  |
|  | <b>Material handling and associated storage</b>  | 0.5 W/ft <sup>2</sup>  |
|  | <b>Drive-up windows at fast food restaurants</b>   | 400W per drive-through   |
| <b>Parking near 24-hour retail entrances</b>   | 800 W per main entry   |  |



**Lighting, Motor, and Transformer Permit Plans Checklist**

2006 Washington State Nonresidential Energy Code Compliance Forms

|   |      |
|---|------|
| Project Address<br><b>McDonald's Restaurant</b> | Date |
|---|------|

The following information is necessary to check a permit application for compliance with the lighting, motor, and transformer requirements in the 2006 Washington State Nonresidential Energy Code.

| Applicability<br>(yes, no, n.a.) | Code<br>Section | Component | Information Required | Location<br>on Plans |
|----------------------------------|-----------------|-----------|----------------------|----------------------|
|----------------------------------|-----------------|-----------|----------------------|----------------------|

**LIGHTING CONTROLS (Section 1513)**

|      |          |                       |   |               |
|------|----------|-----------------------|---|---------------|
| yes  | 1513.1   | Local control/access  | Schedule with type, indicate locations  | E2.0          |
| yes  | 1513.2   | Area controls         | Maximum limit per switch  | E2.0,<br>E4.2 |
| yes  | 1513.3   | Daylight zone control | Schedule with type and features, indicate locations   | E2.0          |
| yes  |          | vertical glazing      | Indicate vertical glazing on plans  | A5.0          |
| n.a. |          | overhead glazing      | Indicate overhead glazing on plans  | A5.0          |
| n.a. | 1513.4   | Display/exhib/special | Indicate separate controls  | E2.0          |
|      | 1513.5   | Exterior shut-off     | Schedule with type and features, indicate location  |               |
| yes  |          | (a) timer w/backup    | Indicate location   | M1.0,<br>E4.1 |
| yes  |          | (b) photocell.        | Indicate location   | M1.0,<br>E4.1 |
|      | 1513.6   | Inter. auto shut-off  | Indicate location   |               |
| n.a. | 1513.6.1 | (a) occup. sensors    | Schedule with type and locations  |               |
| n.a. | 1513.6.2 | (b) auto. switches    | Schedule with type and features (back-up, override capability);<br>Indicate size of zone on plans | E4.1          |
| yes  | 1513.7   | Commissioning         | Indicate requirements for lighting controls commissioning   | E2.0          |

**EXIT SIGNS (Section 1514)**

|     |      |            |                                   |      |
|-----|------|------------|-----------------------------------|------|
| yes | 1514 | Max. watts | Indicate watts for each exit sign | E2.0 |
|-----|------|------------|-----------------------------------|------|

**LIGHTING POWER ALLOWANCE (Section 1530-1532)**

|     |      |                                   |  |  |
|-----|------|-----------------------------------|--|--|
| yes | 1531 | Interior Lighting<br>Summary Form | Completed and attached. Schedule with fixture types,<br>lamps, ballasts, watts per fixture |  |
| yes | 1532 | Exterior Lighting<br>Summary Form | Completed and attached. Schedule with fixture types,<br>lamps, ballasts, watts per fixture |  |

**MOTORS (Section 1511)**

|      |      |                       |   |  |
|------|------|-----------------------|---|--|
| n.a. | 1511 | Elec motor efficiency | MECH-MOT or Equipment Schedule with hp, rpm, efficiency |  |
|------|------|-----------------------|---|--|

**TRANSFORMERS (Section 1540)**

|      |      |              |                              |  |
|------|------|--------------|------------------------------|--|
| n.a. | 1540 | Transformers | Indicate size and efficiency |  |
|------|------|--------------|------------------------------|--|

If "no" is circled for any question, provide explanation:





The Riley Group Inc.

**FILE COPY**

**Permit No.** \_\_\_\_\_

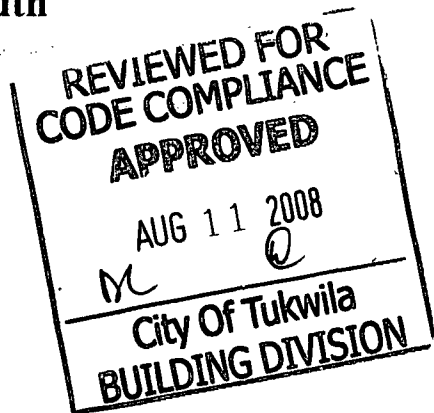
**GEOTECHNICAL ENGINEERING REPORT**

**Riverton Heights McDonald's  
15210 Pacific Highway South  
Tukwila, WA 98188**

**Project No. 2007-021**

**Prepared By:**

**The Riley Group, Inc.  
17522 Bothell Way NE  
Bothell, WA 98011**



**Prepared for:**

**Ms. Anne Thorpe  
McDonald's USA, Inc.  
12131 - 113<sup>th</sup> Avenue NE, Suite 103  
Kirkland, WA 98034**

**February 27, 2007**

Serving the Pacific Northwest

**Main Office: 17522 Bothell Way NE, Bothell, WA 98011  
Tel (425) 415-0551 • Fax (425) 415-0311**

**RECEIVED  
CITY OF TUKWILA**

**APR 30 2008**

**PERMIT CENTER**

**D08-243**



*The Riley Group Inc.*

---

February 27, 2007

Ms. Anne Thorpe  
McDonald's USA, Inc.  
12131 – 113<sup>th</sup> Avenue NE, Suite 103  
Kirkland, WA 98034

**Subject:       Geotechnical Engineering Report  
                  Riverton Heights McDonald's  
                  15210 Pacific Highway South  
                  Tukwila, WA 98188  
                  Project No. 2007-021**

Dear Ms. Thorpe:

As requested, The Riley Group, Inc. (Riley) has performed a geotechnical engineering study for the above-referenced site. The attached report presents our findings and recommendations for the geotechnical anticipated aspects for the project design and construction.

Our field exploration indicates that the site is generally underlain by 3 feet of loose fill over native soil. The native soil includes 3.5 feet of very loose to loose silty SAND with some gravel, clay, and trace organics overlying medium dense to very dense silty SAND with gravel. The fill consists of loose SAND with trace silt. Test boring B-2 which is located at the southwest portion of the sit encountered 6 feet of loose fill over loose native soil. Groundwater seepage was encountered during our field exploration at depths of 11.5 to 15.0 feet below ground surface (bgs).

Based on the subsurface soil observed, the loose soil with organics underneath the site is not suitable for directly supporting building foundations. If the building foundations are directly supported on the loose soil with organic contents, they will be subject to differential settlements due to consolidation. Therefore, we recommend supporting the proposed building and floor slab on pile foundation to transfer the building load to dense soils below the loose soil and organics. Driveway and new pavement sections can be supported on 12 inches of structural fill over geotextile fabrics.

**Serving the Pacific Northwest**

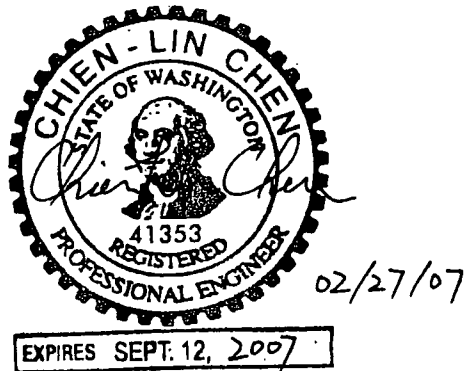
**Main Office: 17522 Bothell Way NE, Bothell, WA 98011  
Tel (425) 415-0551 • Fax (425) 415-0311**

Alternatively, the proposed building can be supported on conventional spread footing foundations bearing on structural fill after removing all loose soil and organic soil. The expected excavation depth is approximately 8 feet bgs in the south of the proposed building area and 4 feet bgs in the north. The floor slab can be similarly supported on the structural fill.

We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,

**THE RILEY GROUP, INC.**



A handwritten signature in black ink, appearing to read "Ricky R. Wang".

Chien-Lin (Johnny) Chen, P.E.  
Project Engineer

Ricky R. Wang, Ph.D., P.E.  
Principal Engineer

JC/RW

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## 1.0 PROJECT DESCRIPTION

The project site is located at 15210 Pacific Highway South in Tukwila, Washington. The approximate location of the site is shown on the Site Vicinity Map, Figure 1. The subject site is currently occupied by an existing McDonald's building and asphalt parking.

Riley understands that the client is planning to redevelop the site, demolish the existing building, and construct a new McDonald's building (5,062 square feet in size) in the middle portion of the site along with the associated parking and utilities. Riley's understanding of the project is based on a Site Sketch (Option A) prepared by Freiheit & HO Architects, Inc. dated November 1, 2006. At the time of the preparation of this report, detailed site grading and building plans were not available for our review. Based on our experience with similar projects, we anticipate that the building will be single-story structure supported on perimeter bearing walls and a series of isolated columns. The building loads are typically from 1 to 2 kips per linear foot for perimeter walls, up to 50 kips for interior isolated columns.

The recommendations in the following sections of this report are based upon our understanding of the above design features. If actual features vary or changes are made, we should review them in order to modify our recommendations as required. In addition, Riley requests to review final design drawings and specifications to verify that our project understanding is correct and that our recommendations have been properly interpreted and incorporated into project design and construction.

## 2.0 SCOPE OF WORK

On February 13, 2007, Riley drilled a total of six test borings to a maximum depth of 16.5 feet below ground surface (bgs). Test borings were drilled with a truck-mounted, hollow-stem auger drill rig. Test borings B-1 and B-2 were drilled in the proposed parking and driveway areas. Test borings B-3 through B-6 were drilled within the proposed building footprint area. The approximate test boring locations are shown on Figure 2.

Using the information obtained from our subsurface exploration, we performed analyses to develop geotechnical recommendations for project design and construction on the following:

- Soil and groundwater conditions
- Seismic considerations
- Site preparation and grading
- Structural fill recommendations
- Foundation support
- Slab-on-grade support
- Retaining walls
- Drainage
- Utilities
- Pavements

### **3.0 SITE CONDITIONS**

#### **3.1 Surface**

The site is a trapezoidal-shaped parcel of land approximately 1.75 acres in size. The site is bounded to the north by South 152<sup>nd</sup> Street, to the east by a retail building and an apartment, to the south by a rental storage shop, and to the west by Pacific Highway South.

The site is currently occupied by an existing McDonald's building and covered by asphalt parking around the building. The site gently slopes down to the southeast with an overall elevation difference of approximately 10 feet.

#### **3.2 Soils**

The soils encountered in the test borings are relatively consistent across the site. The typical soil profile consists of 3 feet of loose fill over native soil. The native soil includes 3.5 feet of very loose to loose silty SAND with some gravel, clay, and trace organics overlying medium dense to very dense silty SAND with gravel. The fill consists of loose SAND with trace silt. Test boring B-2 which is located at the southwest portion of the site encountered 6 feet of loose fill over loose native soil.

Review of the *Geologic Map of Surficial Deposits in the Seattle 30' by 60' Quadrangle, Washington* by James C. Yount, et al. (1993) indicated that the native soils were mapped as Vashon till (Qvt). The native soils include light to dark gray, nonsorted, nonstratified mixture of clay, silt, sand and gravel up to boulder-size. These descriptions are generally different from the soils encountered in our field exploration. The soils we encountered at shallow depth are much looser than the soil described above.

More detailed descriptions of the subsurface conditions encountered are presented on the Test Boring Logs, Figures A-2 through A-7 in Appendix A.

#### **3.3 Groundwater**

Minor groundwater seepage was encountered from 11.5 to 15.0 feet bgs in the test borings B-5 and B-6 during our subsurface investigation. The groundwater seems to be perched above the dense soil layer.

Fluctuations in groundwater level should be expected on a seasonal and annual basis. The level will be highest during the extended periods of heavy seepage in the wet winter months. Given the time that the field exploration was performed, Riley believes that the groundwater should be close to the season-high level.

#### **3.4 Seismic Considerations**

Based on the 2003 International Building Code (IBC), the site soil is Class D (Table 1615.1.1). The earthquake spectral response acceleration at short periods ( $S_s$ ) is 127% g and at 1-second period ( $S_1$ ) is 44% g.

### ***Liquefaction***

Liquefaction is a phenomenon where there is a reduction or complete loss of soil strength due to an increase in water pressure induced by vibrations from a seismic event. Liquefaction mainly affects geologically recent deposits of fine-grained sands that are below the groundwater table. Soils of this nature derive their strength from intergranular friction. The generated water pressure or pore pressure essentially separates the soil grains and eliminates this intergranular friction, thus reducing or eliminating the soil's strength.

We reviewed the soil conditions encountered during field exploration and assessed the potential for liquefaction of the site's soil during an earthquake. Since the native soil below groundwater is dense to very dense, Riley believes that the potential of soil liquefaction during an earthquake event is low.

## **4.0 DISCUSSION AND RECOMMENDATIONS**

### **4.1 General**

Based on our study, the site is suitable for the proposed construction from a geotechnical standpoint. The major geotechnical concern for the project is that the loose soil and organic contents underneath the site may consolidate in the future. If the building is directly supported on the loose soil and organic contents, it will experience a certain amount of differential settlements. In order to avoid the potential of building damage, we recommend supporting the proposed building and floor slab on pile foundation to transfer the building load to dense soil below the loose soil and organics. Driveway and new pavement sections can be supported on 12 inches of structural fill over geotextile fabrics.

Alternatively, the proposed buildings can be supported on conventional spread footing foundations bearing on structural fill after removing all loose soil and organics. The expected excavation depth is approximately 8 feet bgs in the south of the proposed building area and 4 feet bgs in the north. The floor slab can be similarly supported on the structural fill.

Detailed recommendations regarding the above issues and other geotechnical design considerations are provided in the following sections. These recommendations should be incorporated into the final design drawings and construction specifications.

### **4.2 Site Preparation and Grading**

To prepare the site for construction, the existing building and pavements within the proposed building footprint should be demolished and stripped. Surface stripping depths of up to 6 inches should be expected to remove the asphalt surface. All remnants related to previous construction, which occupied the site, should also be cleared and removed from the site.

Once clearing, stripping, and other preparing operations are complete, cuts and fills can be made to establish desired building grades. Prior to placing fill, we recommend proofrolling

all exposed surface to determine if any isolated soft and yielding areas are present. Proofrolling should also be performed in cut areas that will provide direct support for new construction.

The on-site excavated soil has organic contents and is not suitable for use as structural fill. We recommend importing a material that meets the grading requirements listed in Table 1.

**Table 1. Structural Fill**

| U.S. Sieve Size | Percent Passing  |
|-----------------|------------------|
| 3 inches        | 100 percent      |
| No. 4 sieve     | 0 to 75 percent  |
| No. 200 sieve   | 0 to 5 percent * |

\*Based on minus 3/4 inch fraction.

Prior to use, Riley should examine and test all materials imported to the site for use as structural fill. Structural fill materials should be placed in uniform loose layers not exceeding 12 inches and compacted to a minimum of 95 percent of the soil's maximum density, as determined by ASTM Test Designation D-1557 (Modified Proctor) until the desired finished grade is met. The moisture content of the soil at the time of compaction should be within about two percent of its optimum, as determined by this ASTM method.

### **4.3 Foundations**

As discussed, the major geotechnical concern with this project is loose soil and organics underlying the site. If the foundation is directly supported on the loose soil, the building may experience unacceptable post-construction settlement. To avoid excessive building settlement, we recommend supporting the building using piles to transfer building loads to the competent native soil. Alternatively, the proposed buildings can be supported on conventional spread footing foundations bearing on structural fill after removing all loose soil and organics.

#### ***Driven Piles***

Based on the subsurface soil conditions encountered, Riley recommends that 3- to 4-inch steel pin piles be used for the site. The minimum pile embedment depth is 5 feet into the competent native soil (medium dense silty sand with gravel) below the loose layer. Based on our experience with similar project, the pile capacities listed in Table 2 can be used for structural design and pile layout. Riley expects that the pin pile capacities can be reached at approximately 15 to 20 feet bgs. However, the actual pile termination depth should be determined in the field based on pile driving condition.



**Table 2. Pin Pile Design Capacities (tons)**

| Pipe Diameter | Compression Load | Uplift Load | Lateral Load |
|---------------|------------------|-------------|--------------|
| 3"            | 7                | 3           | 0.7          |
| 4"            | 10               | 4           | 1.0          |

Full single pile capacities can be used, provided that pile spacing is at least three pile diameters. For closer spacing, there will be a slight reduction in the allowable single pile capacity due to group effects. The amount of this reduction will depend on the number of piles in the grouping and their spacing. We can provide this information, if required. The lateral load capacity assumes 1-inch deflection on the top of the pile.

Following the successful installation of the driven piles, you should expect maximum total and differential post-construction settlements of ¼-inch to ½-inch.

### ***Spread Footings***

Alternatively, Riley recommends that the proposed building foundations be supported on conventional spread footings bearing on structural fill after removing all loose soil and organics. The expected excavation depth is approximately 8 feet bgs in the south of the proposed building area and 4 feet bgs in the north. Perimeter foundations exposed to the weather should be at a minimum depth of 18 inches below final exterior grades. Interior foundations can be constructed at any convenient depth below the floor slab.

We recommend designing foundations for a net allowable bearing capacity of 2,500 pounds per square foot (psf) on structural fill. For short-term loads, such as wind and seismic, a 1/3 increase in this allowable capacity can be used.

For designing foundations to resist lateral loads, a base friction coefficient of 0.25 can be used. Passive earth pressures acting on the side of the footing and buried portion of the foundation stem wall can also be considered for resisting lateral loads. We recommend calculating this lateral resistance using an equivalent fluid weight of 250 pounds per cubic foot (pcf). At perimeter locations, we recommend not including the upper 12 inches of soil in this computation because they can be affected by weather or disturbed by future grading activity. This value assumes the foundation will be constructed neat against competent fill soil or backfilled with structural fill as described in the Site Preparation and Grading section. The recommended friction and passive resistance values include a safety factor of 1.5.

With spread footing foundations as recommended, you should expect maximum total and differential post-construction settlements of 1-inch and ½-inch, respectively.

#### **4.4 Slab-on-Grade Construction**

With site preparation completed as described in the Site Preparation and Grading section, suitable support for slab-on-grade construction should be provided. Riley recommends that the concrete slab be set on top of piles or firm structural fill. Immediately below the floor slab, we recommend placing a 4-inch thick capillary break layer of clean, free-draining sand or gravel that has less than 5 percent passing the No. 200 sieve. This material will reduce the potential for upward capillary movement of water through the underlying soil and subsequent wetting of the floor slab.

Where moisture by vapor transmission is undesirable, an 8 to 10-mil thick plastic membrane should be placed on a 4-inch thick layer of clean gravel. The membrane should be covered with 1 to 2 inches of clean, moist sand to guard against damage during construction and to aid in curing of the concrete.

For the anticipated floor slab loading, we estimate post-construction floor settlements of ¼- to ½-inch. For thickness design of the slab subjected to point loading from storage racks and fork lift vehicle traffic, we recommend using a subgrade modulus (Ks) of 150 pounds per square inch per inch of deflection (pci).

#### **4.5 Retaining Walls**

At the time of preparation of this report, Riley is not aware of any new retaining walls proposed for the site. If retaining walls will be needed, they should be designed based on the soil parameters provided below.

Riley recommends designing unrestrained walls for an active earth pressure equivalent to a fluid weighing 35 pcf. For restrained walls, an earth pressure imposed by an equivalent fluid weighing 55 pcf should be used for design. For seismic design, an addition uniform load of 5 to 7 H (H is wall height) should be applied to the wall surface. These values assume a horizontal backfill condition without building or traffic surcharge loading on the wall.

The walls must also be provided with adequate drainage and should be waterproofed. A typical retaining wall drainage detail is shown on Figure 3.

#### **4.6 Drainage**

##### ***Surface***

Final exterior grades should promote free and positive drainage away from building. Water must not pond or collect adjacent to foundations or within the immediate building area. We recommend providing a minimum drainage gradient of 3% for a minimum distance of 10 feet from the building perimeter, except in paved locations. In paved locations, a minimum gradient of 1% should be provided unless provisions are included for collection and disposal of surface water adjacent to the structure.

### ***Subsurface***

We recommend installing perimeter foundation drains. A typical recommended drain detail is shown on Figure 4. The foundation drains and roof downspouts should be tightlined separately to an approved discharge facility. Subsurface drains must be laid with a gradient sufficient to promote positive flow to a controlled point of approved discharge.

### ***Infiltration***

Riley understands that an infiltration system is being considered for the on-site disposal of storm water run-off. Riley performed an infiltration test at a depth of 4 feet bgs in test boring B-5. Soil encountered was medium dense silty sand with gravel and trace organics. The test was performed in accordance with a falling head percolation test procedure that generally used in the area. The field rate was measured between 4 to 8 inches per hour.

The field infiltration rate cannot be used directly for system design. Based on our experience with similar projects in the area, Riley recommends that an allowable infiltration rate of 2.5 inches per hour be used for infiltration system design.

Riley recommends that the proposed infiltration surface consist of native sand and gravel without impermeable layers. If isolated silt or clay lenses or other unsuitable soils are encountered, they should be overexcavated and replaced with gravel. A geotechnical engineer should observe the infiltration system construction.

## **4.7 Utilities**

Utility pipes should be bedded and backfilled in accordance with American Public Works Association (APWA) specifications. For site utilities located within the City of Tukwila right-of-ways, bedding and backfill should be completed in accordance with City of Tukwila specifications. The trench backfill should be placed and compacted as structural fill, as described in the Site Preparation and Grading section.

Where utilities occur below unimproved areas, the degree of compaction can be reduced to a minimum of 90 percent of the soil's maximum density as determined by the referenced ASTM standard. As noted, soils excavated on-site are not suitable for use as backfill. Structural fill will need to be imported for backfilling the trenches. The backfill material should satisfy the structural fill requirements listed in the Site Preparation and Grading section.

## **4.8 Pavements**

The asphalt pavement on the existing parking seems to be in acceptable condition. For typical passenger vehicles, the final pavement can be finished by overlaying 2 inches of asphalt concrete. In area where existing pavement surface will be removed during construction, the new pavement section should be constructed using the procedure in the following sections.

Pavement subgrades should be prepared as described in the Site Preparation and Grading section of this report and as discussed below. The subgrade should consist of at least 12 inches of structural fill. Typically, a geotextile fabric such as Mirafi 500X or equivalent can be placed on the subgrade. Regardless of the relative compaction achieved, the subgrade must be firm and relatively unyielding before paving. This condition should be verified by proof-rolling with heavy construction equipment or hand probe by inspector.

With the pavement subgrade prepared as described above, we recommend that the general parking area be paved with flexible pavement surface. The following pavement sections are recommended:

- **For heavy truck traffic areas:** 3 inches of asphalt concrete (AC) over 6 inches of crushed rock base (CRB) over 12 inches of structural fill; and
- **For general parking areas:** 2 inches of AC over 4 inches of CRB over 12 inches of structural fill.

The asphalt paving materials used should conform to the Washington State Department of Transportation (WSDOT) specifications for Class B asphalt concrete and CRB surfacing.

Long-term pavement performance will depend on surface drainage. A poorly-drained pavement section will be subject to premature failure as a result of surface water infiltrating into the subgrade soils and reducing their supporting capability.

For optimum pavement performance, surface drainage gradients of no less than two percent are recommended. Also, some degree of longitudinal and transverse cracking of the pavement surface should be expected over time. Regular maintenance should be planned to seal cracks when they occur.

## 5.0 ADDITIONAL SERVICES

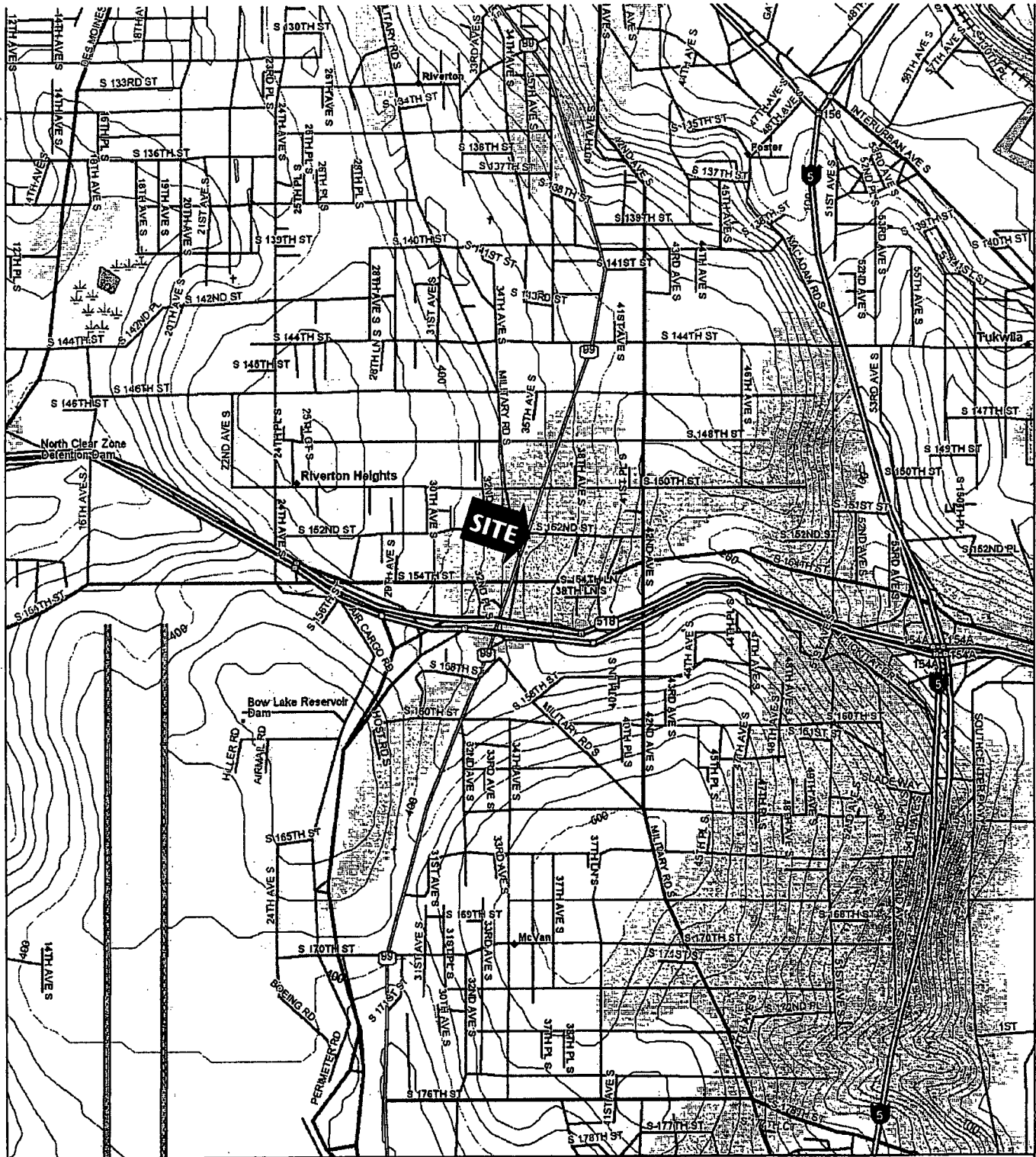
Riley is available to provide further geotechnical consultation as the project design develops. We should review the final design and specifications in order to verify that earthwork and foundation recommendations have been properly interpreted and incorporated into project design and construction.

Riley is also available to provide geotechnical engineering and monitoring services during construction. The integrity of the earthwork and construction depends on proper site preparation and procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent. Construction monitoring services are not part of this scope of work. If these services are desired, please let us know and we will prepare a cost proposal.

## **6.0 LIMITATIONS**

This report is the property of The Riley Group, Inc., McDonald's USA, Inc., and their designated agents and was prepared in accordance with generally accepted geotechnical engineering practices. This report is intended for specific application to the Riverton Heights McDonald's at 15210 Pacific Highway South in Tukwila, Washington and for the exclusive use of McDonald's USA, Inc. and its authorized representatives. No other warranty, expressed or implied, is made.

The analyses and recommendations presented in this report are based upon data obtained from the test borings drilled on-site. Variations in soil conditions can occur, the nature and extent of which may not become evident until construction. If variations appear evident, The Riley Group, Inc. should be requested to reevaluate the recommendations in this report prior to proceeding with construction.



**DELORME**

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Scale 1" = 24,000  
1" = 2000 ft



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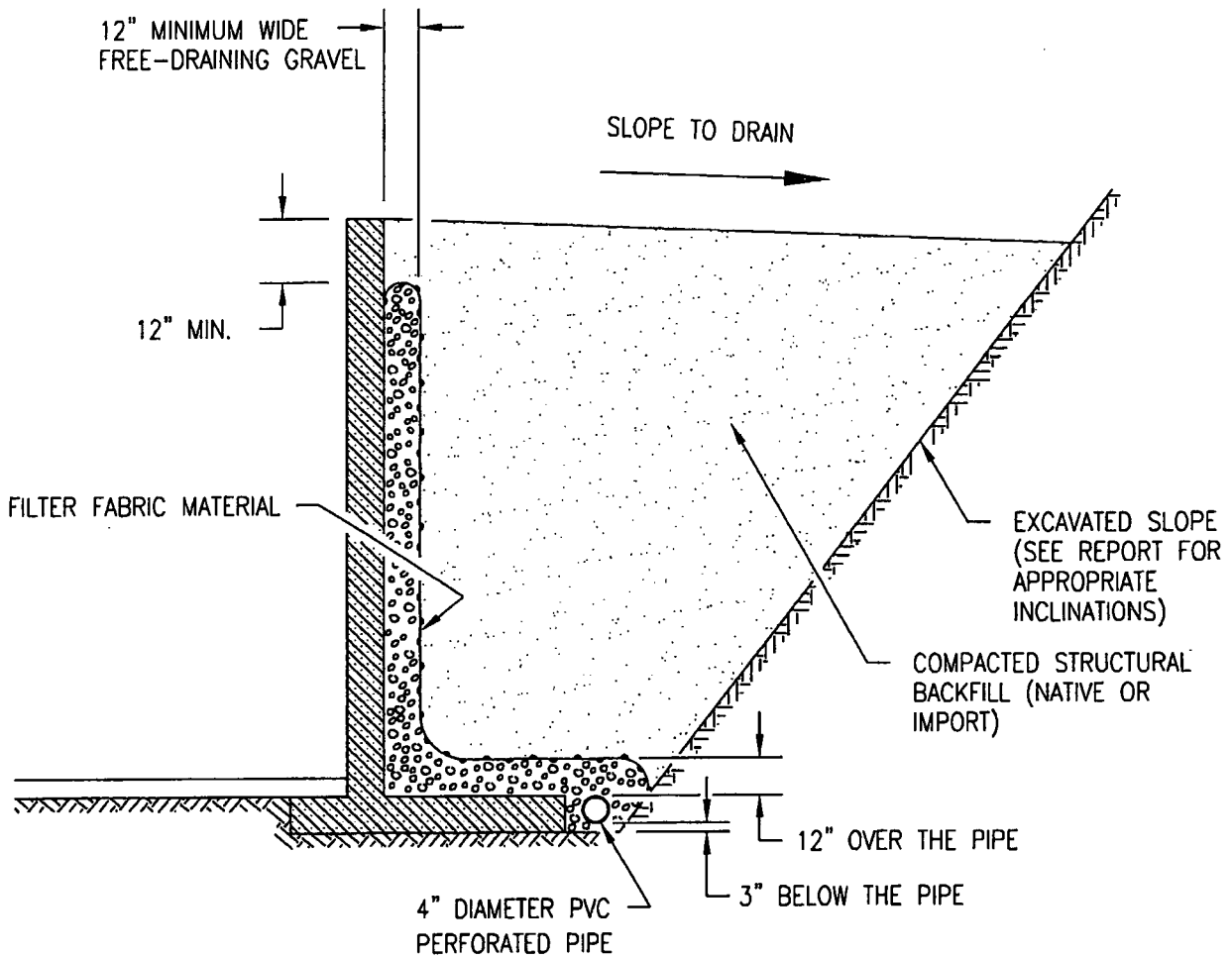
*Riverton Heights McDonald's*

*Site Vicinity Map*

*Figure 1*

Site Address: 15210 Pacific Highway South, Tukwila, Washington





NOT TO SCALE



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17522 BOTHELL WAY NE  
BOTHELL, WASHINGTON 98011

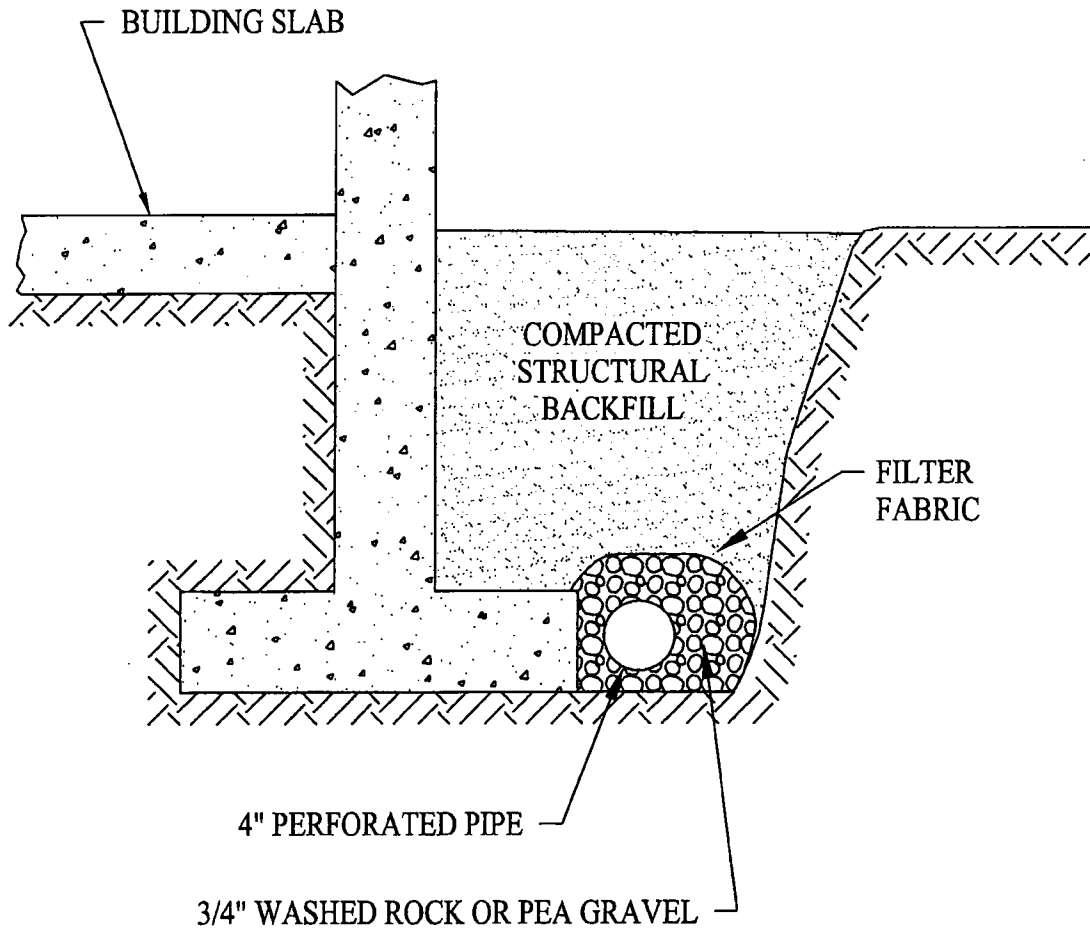
*Riverton Heights McDonald's*

*Retaining Wall Drainage Detail*

*Figure 3*

Site Address: 15210 Pacific Highway South, Tukwila, Washington





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*Riverton Heights McDonald's*

*Typical Footing Drain Detail*

*Figure 4*

Site Address: 15210 Pacific Highway South, Tukwila, Washington

**APPENDIX A  
FIELD EXPLORATION AND LABORATORY TESTING**

Riverton Heights McDonald's  
15210 Pacific Highway South  
Tukwila, WA 98188




On February 13, 2007, we performed our field exploration using a truck-mounted drill rig. We explored subsurface soil conditions at the site by advancing eight test borings to a maximum depth of 16.5 feet below existing grade. The test boring locations are shown on Figure 2. The test boring locations were approximately determined by measurements from existing property lines and streets. The Test Boring Logs are presented on Figures A-2 through A-7.

A geologist/engineer from our office conducted the field exploration and classified the soil conditions encountered, maintained a log of each test boring, obtained representative soil samples, and observed pertinent site features. All soil samples were visually classified in accordance with the Unified Soil Classification System (USCS) described on Figure A-1.

Representative soil samples obtained from the test borings were placed in closed containers and taken to our laboratory for further examination and testing. The moisture content of a typical sample was measured and is reported on the Test Boring Logs.

| MAJOR DIVISIONS                                   |   |  | LETTER SYMBOL   | TYPICAL DESCRIPTION |   |
|---|---|--|---|---------------------|---|
| COARSE GRAINED SOILS                              | More than 50% material larger than No. 200 sieve  | GRAVELS<br>More than 50% of coarse fraction is larger than No. 4 sieve | CLEAN GRAVELS<br><5% fines                                | GW                  | Well-graded gravels, gravel-sand mixtures, little or no fines.    |
|   |   |  | GRAVELS with fines  | GP                  | Poorly-graded gravels, gravel-sand mixtures, little or no fines.  |
|   |   | SANDS<br>More than 50% of coarse fraction is smaller than No. 4 sieve  | CLEAN SANDS<br><5% fines                                  | GM                  | Silty gravels, gravel-sand-silt mixtures, non-plastic fines.      |
|   |   |  | GRAVELS with fines  | GC                  | Clayey gravels, gravel-sand-clay mixtures, plastic fines.         |
|   | More than 50% material smaller than No. 200 sieve | SANDS AND CLAYS<br>Liquid limits less than 50%                         | CLEAN SANDS<br><5% fines                                  | SW                  | Well-graded sands, gravelly sands, little or no fines.            |
|   |   |  | SANDS with fines  | SP                  | Poorly-graded sands or gravelly sands, little or no fines.        |
|   |   |  | SANDS with fines  | SM                  | Silty sands, sand-silt mixtures, non-plastic fines.               |
|   |   | SANDS AND CLAYS<br>Liquid limits greater than 50%                      | SANDS with fines  | SC                  | Clayey sands, sand-clay mixtures, plastic fines.                  |
|   |   |  | SANDS AND CLAYS<br>Liquid limits less than 50%            | ML                  | Inorganic silts, rock flour, clayey silts with slight plasticity. |
| SANDS AND CLAYS<br>Liquid limits greater than 50% | SANDS AND CLAYS<br>Liquid limits less than 50%    | CL   | Inorganic clays of low to medium plasticity, (lean clay). |                     |   |
|   | SANDS AND CLAYS<br>Liquid limits greater than 50% | OL   | Organic silts and organic clays of low plasticity.        |                     |   |
|   | SANDS AND CLAYS<br>Liquid limits greater than 50% | MH   | Inorganic silts, elastic.                                 |                     |   |
| HIGHLY ORGANIC SOILS                              |   |  | PT  | Peat.               |   |

### DEFINITION OF TERMS AND SYMBOLS

|                |              |                  |   |
|----------------|--------------|------------------|---|
| SAND or GRAVEL | Density      | SPT (Blows/Foot) |  2" Outside diameter split spoon sampler<br> 2.4" Inside diameter ring sampler or Shelby tube<br> Water level (date) |
|                | Very loose   | 0-4              |   |
| SILT or CLAY   | Loose        | 4-10             | Tr Torvane reading, tsf<br>Pp Penetrometer reading, tsf<br>DD Dry density, pcf<br>LL Liquid limit, percent<br>PI Plasticity index<br>N Standard penetration, blows per foot   |
|                | Medium dense | 10-30            |   |
|                | Dense        | 30-50            |   |
|                | Very dense   | >50              |   |
|                | Consistency  | SPT (Blows/Foot) |   |
|                | Very soft    | 0-2              |   |
| Soft           | 2-4          |                  |   |
| Medium stiff   | 4-8          |                  |   |
| Stiff          | 8-15         |                  |   |
| Very stiff     | 15-30        |                  |   |
| Hard           | >30          |                  |   |



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*Riverton Heights McDonald's*

*Unified Soil Classification System*

*Figure A-1*

Site Address: 15210 Pacific Highway South, Tukwila, Washington

## Boring No. B-1

Logged by : PL  
Date: 2/13/07

Approximate Elev.: N/A

| Soil Description  | Consistency/<br>Relative<br>Density | Depth<br>(feet) | Sample | (N)<br>Blows<br>/ft | Moisture<br>Content<br>(%) |  |
|---|-------------------------------------|-----------------|--------|---------------------|----------------------------|--|
| Asphalt 3" underlain by gravel 6".<br>Brown SAND with trace silt, (Fill). | Loose                               | 5               | I      | 15                  | 14.3                       |  |
| Gray silty SAND with some gravel,<br>damp, medium dense, (SM).            | Medium<br>Dense                     |                 |        |                     |                            |  |
| Gray silty SAND with little gravel<br>and organics, moist, dense, (SM).   | Dense                               |                 |        | 30                  | 27.1                       |  |
| Terminated at 9.0'.<br>No groundwater seepage<br>encountered.             |                                     | 10              |        |                     |                            |  |
|   |                                     | 15              |        |                     |                            |  |



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*Riverton Heights McDonald's*

*Test Boring Log B-1*

*Figure A-2*

Site Address: 15210 Pacific Highway South, Tukwila, Washington



## Boring No. B-3

Logged by : PL

Date: 2/13/07

Approximate Elev.: N/A

| Soil Description   | Consistency/<br>Relative<br>Density | Depth<br>(feet) | Sample    | (N)<br>Blows<br>/ft | Moisture<br>Content<br>(%) |  |
|--|-------------------------------------|-----------------|-----------|---------------------|----------------------------|--|
| Asphalt 3" underlain by gravel 6".<br><br>Brown SAND with little silt, (Fill).   | Loose                               |                 |           |                     |                            |  |
| Homogenous brown to dark brown to gray SAND with little silt, trace organics, to silty SAND with trace gravel, damp, very loose, (SM). | Very Loose                          | 5               | <br>—<br> | 0                   | 13.8                       |  |
| Mottled brown to gray silty SAND with little gravel and silt, slightly plastic, damp, medium dense, (SM).                              | Medium Dense                        | 10              | <br>—<br> | 19                  | 21.9                       |  |
| Brown silty SAND with little gravel with SAND lens (15.7' - 15.9' moist), damp, medium dense, (SM).                                    | Medium Dense                        | 15              | <br>—<br> | 25                  | 12.9                       |  |
| Terminated at 16.5'.<br>No groundwater seepage encountered.  |                                     |                 |           |                     |                            |  |



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*Riverton Heights McDonald's*

*Test Boring Log B-3*

*Figure A-4*

Site Address: 15210 Pacific Highway South, Tukwila, Washington

## Boring No. B-4

Logged by : PL

Date: 2/13/07

Approximate Elev.: N/A

| Soil Description  | Consistency/<br>Relative<br>Density | Depth<br>(feet) | Sample | (N)<br>Blows<br>/ft | Moisture<br>Content<br>(%) |  |
|---|-------------------------------------|-----------------|--------|---------------------|----------------------------|--|
| Asphalt 3" underlain by gravel 6".<br>Brown SAND with little silt, (Fill).  | Loose                               |                 |        |                     |                            |  |
| Gray silty SAND with some gravel,<br>trace organic clay, damp, loose,<br>(SM).  | Loose                               | 5               | I      | 4                   | 8.2                        |  |
| Mottled orange brown to dark<br>brown silty SAND with some<br>gravel, trace clay, damp, medium<br>dense, (SM).                                    | Medium<br>Dense                     | 10              | I      | 20                  | 12.1                       |  |
| Brown silty SAND with SAND lens<br>(16.0' - 16.1' moist), transitioning to<br>mottled orange brown sandy SILT<br>with clay, damp, stiff, (ML/SM). | Stiff/Medium<br>Dense               | 15              | I      | 14                  | 17.6                       |  |
| Terminated at 16.5'.<br>No groundwater seepage<br>encountered.  |                                     |                 |        |                     |                            |  |



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*Riverton Heights McDonald's*

*Test Boring Log B-4*

*Figure A-5*

Site Address: 15210 Pacific Highway South, Tukwila, Washington

## Boring No. B-5

Logged by : PL

Date: 2/13/07

Approximate Elev.: N/A

| Soil Description   | Consistency/<br>Relative<br>Density | Depth<br>(feet) | Sample    | (N)<br>Blows<br>/ft | Moisture<br>Content<br>(%) |             |
|--|-------------------------------------|-----------------|-----------|---------------------|----------------------------|-------------|
| Asphalt 3" underlain by gravel 6".<br>Brown SAND with trace silt, (Fill).  | Loose                               |                 |           |                     |                            |             |
| Mottled orange brown to brown to gray silty SAND with some gravel, trace organici clay, slight plasticity, damp, medium dense, (SM). | Medium Dense                        | 5               | <br>—<br> | 16                  | 13.3                       |             |
| Brown silty SAND with some gravel, damp, medium dense, (SM).   | Medium Dense                        | 10              | <br>—<br> | 19                  | 11.5                       |             |
| Brown silty SAND with some gravel, damp to wet, very dense, (SM).  | Very Dense                          | 15              | <br>—<br> | 73/12"              | 12.3                       | ▼ (2/13/07) |
| Terminated at 16.5'.<br>Groundwater seepage encountered at 15.0'   |                                     |                 |           |                     |                            |             |



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*Riverton Heights McDonald's*

*Test Boring Log B-5*

*Figure A-6*

Site Address: 15210 Pacific Highway South, Tukwila, Washington



## Boring No. B-6

Logged by : PL  
Date: 2/13/07

Approximate Elev.: N/A

| Soil Description   | Consistency/<br>Relative<br>Density | Depth<br>(feet) | Sample | (N)<br>Blows<br>/ft | Moisture<br>Content<br>(%) |               |
|--|-------------------------------------|-----------------|--------|---------------------|----------------------------|---------------|
| Asphalt 3" underlain by gravel 6".<br>Brown SAND with trace silt, (Fill).                                      | Loose                               |                 |        |                     |                            |               |
| Mottled orange brown to grayish<br>brown silty SAND with some gravel<br>and silt, damp, medium dense,<br>(SM). | Medium<br>Dense                     | 5               |        |                     |                            |               |
| Brown silty SAND with some<br>gravel, damp (moist/wet @ tip),<br>medium dense, (SM).                           | Medium<br>Dense                     | 10              | I      | 22                  | 9.0                        | ▼ (2/13/07)   |
| Brown silty SAND with some<br>gravel, damp, very dense, (SM).  | Very<br>Dense                       | 15              | I      | 50/5"               | ---                        | (No Recovery) |
| Terminated at 16.5'.<br>Groundwater seepage<br>encountered at 11.5'  |                                     |                 |        |                     |                            |               |



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*Riverton Heights McDonald's*

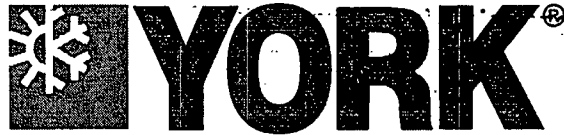
*Test Boring Log B-6*

*Figure A-7*

Site Address: 15210 Pacific Highway South, Tukwila, Washington

Permit No. \_\_\_\_\_

# TECHNICAL GUIDE



## Heating and Air Conditioning

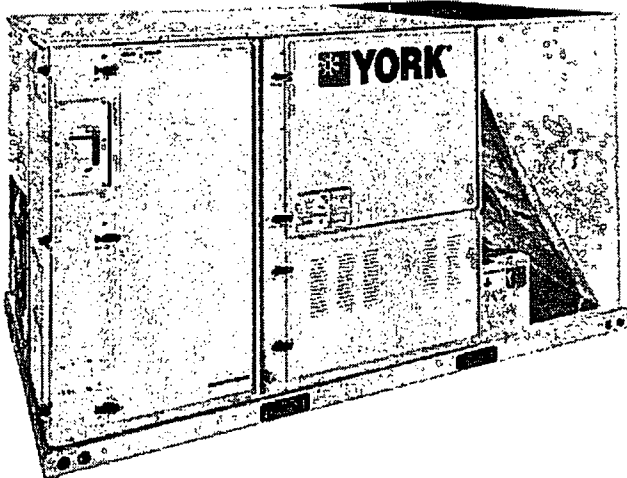
# PREDATOR®

**HIGH EFFICIENCY  
SINGLE PACKAGE AIR CONDITIONERS AND  
SINGLE PACKAGE GAS/ELECTRIC UNITS**

DH 078, 090, 102, 120 and 150

6-1/2, 7-1/2, 8-1/2, 10 and 12-1/2 NOMINAL TONS

10.0-11.5 EER



### DESCRIPTION

#### ASHRAE 90.1 COMPLIANT

YORK® Predator® units are convertible single packages with a common footprint cabinet and common roof curb for all 6-1/2 through 12-1/2 ton models. All units have two compressors with independent refrigeration circuits to provide 2 stages of cooling. The units were designed for light commercial applications and can be easily installed on a roof curb, slab, or frame.

All Predator® units are self-contained and assembled on rigid full perimeter base rails allowing for 3-way forklift access and overhead rigging. Every unit is completely charged, wired, piped, and tested at the factory to provide a quick and easy field installation.

All units are convertible between side and down airflow. Independent economizer designs are used on side and down discharge applications, as well as all tonnage sizes.

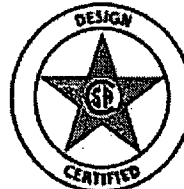
Predator® units are available in the following configurations: cooling only, cooling with electric heat, and cooling with gas heat. Electric heaters are available as factory-installed options or field-installed accessories.

Tested in accordance with:

**REVIEWED FOR  
CODE COMPLIANCE  
APPROVED**

AUG 11 2008

*[Signature]*  
City of Tukwila  
SP® DIVISION  
C US



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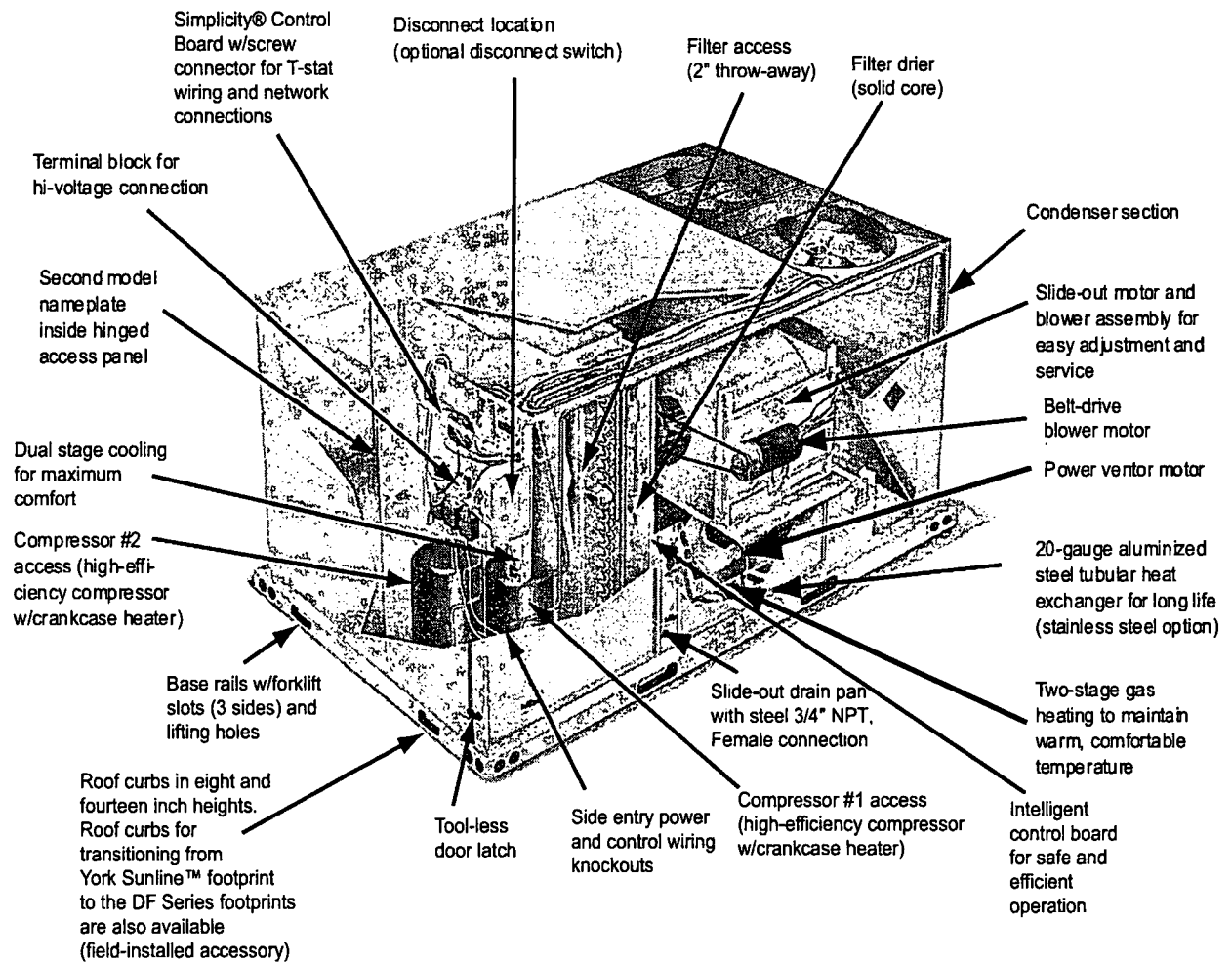
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**FIGURE 1 - PREDATOR® COMPONENT LOCATION (DH120 SHOWN)**

## FEATURES

- **High Efficiency** – High efficiency units reach as high as 11.5 EER. Gas/electric units have electronic spark ignition and power vented combustion with steady state efficiencies of 80%. These efficiencies exceed all legislated minimum levels and provide low operating costs.
- **Service Friendly** – The Predator® incorporates a number of enhancements which improve serviceability.

The motor and blower slide out of the unit as a common assembly. This facilitates greater access to all the indoor airflow components, thus simplifying maintenance and adjustment.

Service time is reduced through the use of hinged, toolless panels. Such panels provide access to frequently inspected components and areas, including the control box, compressors, filters, indoor motor & blower, and the heating section. The panels are screwed in place at the factory to prevent access by children or other unauthorized persons. It is recommended that the panels be secured with screws once service is complete.

Service windows have been placed in both condenser section walls. Rotation of the cover allows easy access to the condenser coils for cleaning or inspection.

Both the unit control board and ignition control board utilize flash codes to aid in diagnosis of unit malfunctions. Unique alarm codes quickly identify the source of the unit alarm.

All units use the same standard filter size. This standardization removes any confusion on which filter sizes are needed for replacement.

The non-corrosive drain pan slides out of the unit to permit easy cleaning. The drain pan is accessed by removing the drain pan cover plate on the rear of the unit. Once the plate is removed, the drain pan slides out through the rear of the unit.

All Predator® units have a second model nameplate located inside the control access door. This is to prevent deterioration of the nameplate through weathering.

- **Environmentally Aware** – For improved Indoor Air Quality, foil faced insulation is used exclusively throughout the units.
- **Balanced Heating** – The Predator® offers “Ultimate Heating Comfort” with a balance between 1<sup>st</sup> and 2<sup>nd</sup> stage gas heating. The first stage of a gas heat Predator® unit provides 60% of the heating capacity. Balanced heating allows the unit to better maintain desired temperatures.
- **Convertible Airflow Design** – The side duct openings are covered when they leave the factory. If a side supply/return is desired, the installer simply removes the two side duct covers from the outside of the unit and installs them over the down shot openings. No panel cutting is required. Convertible airflow design allows maximum field flexibility and minimum inventory.
- **System Protection** - Suction line freezestats are supplied on all units to protect against loss of charge and coil frosting when the economizer operates at low outdoor air temperatures while the compressors are running. Every unit has solid-core liquid line filter-driers and high and low-pressure switches. Internal compressor protection is standard on all compressors. Crankcase heaters are standard on reciprocating compressors. Scroll compressors do not require crankcase heaters. Phase Monitors are standard on units with scroll compressors. This accessory monitors the incoming power to the unit and protects the unit from phase loss and reversed phase rotation.
- **Advanced Controls** - Simplicity™ control boards have standardized a number of features previously available only as options or by utilizing additional controls.
  - **Low Ambient** - An integrated low-ambient control allows all units to operate in the cooling mode down to 0°F outdoor ambient without additional assistance. Optionally, the control board can be programmed to lockout the compressors when the outdoor air temperature is low or when free cooling is available.
  - **Anti-Short Cycle Protection** - To aid compressor life, an anti-short cycle delay is incorporated into the standard controls. Compressor reliability is further ensured by programmable minimum run times. For testing, the anti-short cycle delay can be temporarily overridden with the push of a button.
  - **Fan Delays** - Fan on and fan off delays are fully programmable. Furthermore, the heating and cooling fan delay times are independent of one another. All units are programmed with default values based upon their configuration of cooling and heat.
  - **Safety Monitoring** - The control board monitors the high and low-pressure switches, the freezestats, the gas valve, if applicable, and the temperature limit switch on gas and electric heat units. The unit control board will alarm on ignition failures, compressor lockouts and repeated limit switch trips.
  - **Nuisance Trip Protection and Strikes** - To prevent nuisance trouble calls, the control board uses a “three times, you’re out” philosophy. The high and low-pressure switches and the freezestats must trip three times within two hours before the unit control board will lock out the associated compressor.
- **On Board Diagnostics** - Each alarm will energize a trouble light on the thermostat, if so equipped, and flash an alarm code on the control board LED. Each high and low-pressure switch alarm as well as each freezestat alarm has its own flash code. The control board saves the five most recent alarms in memory, and these alarms can be reviewed at any time. Alarms and programmed values are retained through the loss of power.
- **Reliable** – From the beginning – All units undergo computer automated testing before they leave the factory. Units are tested for refrigerant charge and pressure, unit amperage, and 100% functionality. For the long term – All Predator® units are painted with a long lasting, powder paint that stands up over the life of the unit. The paint used has been proven by a 1000 hour salt spray test.
- **Flexible Placement** – All models and configurations share the same cabinet/footprint and thus the same roof curb. You have the flexibility to set one curb and choose the correct tonnage size and heating option after the internal loads have been determined.
 

To further simplify planning and installation, Predator® cabinets are designed to fit your roof. With the optional roof curb, the unit ductwork is designed to fit around 24” on-center joists or between 48” on-center joists.

The drain pan can be rotated to drain to either the front or the rear of the unit. Additionally, the drain pan can be fitted to drain through the roof curb. As it is sometimes difficult to have a level installation, the drain pan features a generous slope to ensure proper drainage.
- **Full Perimeter Base Rails** – The permanently attached base rails provide a solid foundation for the entire unit and protect the unit during shipment. The rails offer forklift access from 3 sides, and rigging holes are available so that an overhead crane can be used to place the units on a roof.
- **Easy Installation** – Gas and electric utility knockouts are supplied in the unit underside as well as the side of the unit. A clearly identified location is provided to mount a field supplied electrical disconnect switch. Utility connections can be made quickly and with a minimum amount of field labor.
 

All units are shipped with 2” throw-away filters installed.
- **Wide Range of Indoor Airflows** – All indoor fan motors are belt-drive type providing maximum flexibility to handle most airflow requirements. For high static applications, factory installed alternate indoor fan motors are available. With the optional indoor fan motor, all units can supply nominal airflow at a minimum of 1.5” ESP.
- **Warranty** - All models include a 1-year limited warranty on the complete unit. Compressors and electric heater elements each carry a 5-year warranty. Aluminized steel and stainless steel tubular heat exchangers carry a 10-year warranty.

## FACTORY INSTALLED OPTIONS

YORK® offers several equipment options factory installed, for the Predator® line.

- **Optional Factory Installed Economizers** - Predator units offer a variety of optional factory installed economizers with low leak dampers. The outdoor air enthalpy sensor enables economizer operation if the outdoor enthalpy is less than the setpoint of the economizer logic module. See Table 41 to determine the correct economizer for your application.
    - **Downflow Economizer - (With barometric relief)** - The economizer is provided with a single enthalpy input. The economizer is 2% low leakage type, and is shipped installed and wired. The installer needs only to assemble and mount the outdoor air hood (Provided). The economizer has spring return, fully modulating damper actuators and is capable of introducing up to 100% outdoor air. As the outdoor air intake dampers open, the return air dampers close. The changeover from mechanical refrigeration to economizer operation is regulated by the standard single enthalpy input. There is an optional input dual dry bulb available. To meet regulated air standards, the economizer control accepts an optional CO<sub>2</sub> input for demand ventilation. With single enthalpy input, the economizer control monitors outdoor air. The dual enthalpy kit provides a second input used to monitor the return air. With a dual input kit installed, the economizer control compares the values of the two enthalpy or temperature inputs and positions the dampers to provide the maximum efficiency possible.
    - **Horizontal Economizer - (Without barometric relief)** - All features of the downflow economizer exist except you must order the duct mount barometric relief separately. **You must order a 1EH0408 if you are installing a power exhaust. You can order a 1RD0411 Barometric Relief for horizontal flow economizers only.**
    - **BAS Ready Economizer -(With barometric relief)** - The economizer is provided with a Belimo actuator that requires a 0-10V DC input from an external source (i.e., field installed building automation system controller). Power exhaust options are available. The economizer is 2% low leakage type with spring return and fully modulating dampers capable of introducing up to 100% outside air. Also include 2" pleated filters.
    - **Slab Economizer for Energy Recovery Ventilators-(With barometric relief and Fresh Air Hood)** - The economizer is provided with a single enthalpy input. The economizer is 2% low leakage type, and is shipped installed and wired. The economizer has spring return, fully modulating damper actuators and is capable of introducing up to 100% outdoor air. As the outdoor air intake dampers open, the return air dampers close. The changeover from mechanical refrigeration to economizer operation is regulated by the standard single enthalpy input. There is an optional input dual dry bulb available. To meet regulated air standards, the economizer control accepts an optional CO<sub>2</sub> input for demand ventilation. With single enthalpy
- input, the economizer control monitors outdoor air. The dual enthalpy kit provides a second input used to monitor the return air. With a dual input kit installed, the economizer control compares the values of the two enthalpy or temperature inputs and positions the dampers to provide the maximum efficiency possible.
- **Power Exhaust (Downflow only)** - This accessory installs in the unit with a down flow economizer.
  - **Motorized Outdoor Air Damper** - The motorized outdoor air damper includes a slide-in/plug-in damper assembly with an outdoor air hood and filters. The outdoor air dampers open to the preset position when the indoor fan motor is energized. The damper has a range of 0% to 100% outdoor air entry. Factory installed option or field installed accessory.
  - **Alternate Indoor Blower Motor** - For applications with high static restrictions, units are offered with optional indoor motors that provide higher static output and/or higher airflow, depending upon the installer's needs.
  - **Aluminized Steel Gas Heat Exchanger** - For applications in non-corrosive environments.
  - **Stainless Steel Gas Heat Exchanger** - For applications in corrosive environments, this option provides a full stainless steel heat exchanger assembly.
  - **Stainless Steel Drain Pan** - An optional rust-proof stainless steel drain pan is available to provide years of trouble-free operation in corrosive environments.
  - **Electric Heaters** - The electric heaters range from 9kW to 54kW and are available in all the voltage options of the base units. All heaters are dual staged. All heaters are intended for single point power supply.
  - **Disconnect Switch** - For gas heat units and cooling units with electric heat, a HACR breaker sized to the unit is provided. For cooling only units, a switch sized to the largest electric heat available for the particular unit is provided. Factory installed option only.
  - **Convenience Outlet - (Non-Powered/Powered)** - This option locates a 120V single-phase GFCI outlet with cover, on the corner of the unit housing adjacent to the compressors. The "Non-powered" option requires the installer to provide the 120V single-phase power source and wiring. The "Powered" option is powered by a step-down transformer in the unit. Factory installed option only.
  - **Smoke Detectors** - The smoke detectors stop operation of the unit by interrupting power to the control board if smoke is detected within the air compartment. Available for both the supply and/or return air.

### **WARNING**

Factory installed smoke detectors in the return air, may be subjected to freezing temperatures during "off" times due to outside air infiltration. These smoke detectors have an operational limit of 32 °F to 131°F. Smoke detectors installed in areas that could be outside those limitations will have to be moved to prevent having false alarms.

- **Phase Monitors** - Designed to prevent unit damage. The phase monitor will shut the unit down in an out-of phase condition. **(Standard on units with Scroll Compressors.)**
- **Coil Guard** - Customers can purchase a coil guard kit to protect the condenser coil from damage. Additionally, this kit stops animals and foreign objects from entering the space between the inner condenser coil and the main cabinet. This is not a hail guard kit.
- **Dirty Filter Switch** - This kit includes a differential pressure switch that energizes the fault light on the unit thermostat, indicating that there is an abnormally high pressure drop across the filters. Factory installed option or field installed accessory.
- **Technicoat Condenser Coils** - The condenser coils are coated with a phenolic coating for protection against corrosion due to harsh environments.
- **Technicoat Evaporator Coil** - The evaporator coils are coated with a phenolic coating for protection against corrosion due to harsh environments.
- **BAS - Building Automation System Controls Simplicity™ INTELLI-Comfort™ Control** - The York® Simplicity™ INTELLI-Comfort™ control is factory installed. It includes a supply air sensor, a return air sensor, and an outside air sensor. There are provisions for a field installed dirty filter indicator switch, an air-proving switch, an Outside Air Humidity sensor, a Return Air Humidity sensor, an Inside IAQ sensor, and an Outside Air IAQ sensor. Construction mode operation, 365-day real time clock with 7 day programming plus holiday scheduling is built-in. Two different modes of demand ventilation are achieved through the INTELLI-Comfort™ using CO<sub>2</sub> sensors. It uses an inside CO<sub>2</sub> sensor to perform Demand Ventilation. It can also use an Outside CO<sub>2</sub> sensor to perform Differential Demand Ventilation. It uses a Patented Comfort Ventilation algorithm to provide comfortable ventilation air temperature. The patented economizer-loading algorithm will protect the equipment when harsh operating conditions exist. Humidity in the occupied space or return duct can be monitored and controlled via humidity sensors and the on-board connection for hot gas re-heat system. It uses the INTELLI-Start™ algorithm to maximize energy savings by recovering the building from the Unoccupied Setpoints to the Occupied Setpoints just in time for the Occupied Time Period to begin. The Simplicity™ INTELLI-Comfort™ balances space temperature, ventilation air temperature, CO<sub>2</sub> and humidity for ultimate comfort.
- **Simplicity™ INTELLI-Comfort™ with ModLINC Control** - The York® Simplicity™ INTELLI-Comfort™ with ModLINC control is factory installed. It includes all the features of the INTELLI-Comfort™ control with an additional control to translate communications from MODBUS to the BACnet MSTP protocol.
- **Novar® BAS Control** - The Novar® ETC-3 building automation system controller is factory installed. Includes supply air sensor, return air sensor, dirty filter indicator switch, and air proving switch.
- **Johnson Controls BAS Control** - The Johnson Control YK-UNT-1126 building automation system controller is factory installed. Includes supply air sensor, return air sensor, dirty filter indicator switch, and air proving switch.
- **CPC BAS Control** - The Computer Process Controls Model 810-3060 ARTC Advanced Rooftop building automation system controller is factory installed. Includes supply air sensor, return air sensor, dirty filter indicator switch and air proving switch.
- **Honeywell BAS Control** - The Honeywell W7750C building automation system controller is factory installed. Includes air supply sensor, return air sensor, dirty filter indicator switch, and air proving switch.

## FIELD INSTALLED ACCESSORIES

YORK® offers several equipment accessories for field installation, for the Predator® line.

- **Downflow Economizer - (With barometric relief)** - The economizer is provided with a single enthalpy input. The economizer is 2% low leakage type. The economizer has spring return, fully modulating damper actuators and is capable of introducing up to 100% outdoor air. As the outdoor air intake dampers open, the return air dampers close. The changeover from mechanical refrigeration to economizer operation is regulated by the standard single enthalpy input. There is an optional input dual dry bulb available. To meet regulated air standards, the economizer control accepts an optional CO<sub>2</sub> input for demand ventilation. With single enthalpy input, the economizer control monitors outdoor air. The dual enthalpy kit provides a second input used to monitor the return air. With a dual input kit installed, the economizer control compares the values of the two enthalpy or temperature inputs and positions the dampers to provide the maximum efficiency possible
- **Horizontal Economizer - (Without barometric relief)** - All features of the downflow economizer exist except you must order the duct mount barometric relief separately. **You must order a 1EH0408 if you are installing a power exhaust. You can order a 1RD0411 Barometric Relief for horizontal flow economizer.**
- **Slab Economizer for Energy Recovery Ventilator - (Without barometric relief or Fresh Air Hood)** - The economizer is provided with a single enthalpy input. The economizer is 2% low leakage type. The economizer has spring return, fully modulating damper actuators and is capable of introducing up to 100% outdoor air. As the outdoor air intake dampers open, the return air dampers close. The changeover from mechanical refrigeration to economizer operation is regulated by the standard single enthalpy input. There is an optional input dual dry bulb available. To meet regulated air standards, the economizer control accepts an optional CO<sub>2</sub> input for demand

ventilation. With single enthalpy input, the economizer control monitors outdoor air. The dual enthalpy kit provides a second input used to monitor the return air. With a dual input kit installed, the economizer control compares the values of the two enthalpy or temperature inputs and positions the dampers to provide the maximum efficiency possible.

**You can order 1EH0409 Barometric Relief/FA Hood for field installations without an ERV.**

- **Dual Enthalpy Control, Accessory** - This kit contains the required components to convert a single enthalpy economizer to dual enthalpy.
- **Barometric Relief Damper** - Zero to 100% capacity barometric relief dampers for use with horizontal flow, or field installed slab economizers.
- **Power Exhaust** - This accessory installs in the unit with a down flow economizer. Power exhaust plugs into the connector in the unit bulkhead. **You must purchase 1EH0408 barometric relief when applying to a horizontal flow application.**
- **Manual Outdoor Air Damper** - Like the motorized outdoor air damper, each manual outdoor air damper includes a slide-in damper assembly with an outdoor air hood and filters. Customers have a choice of dampers with ranges of 0% to 100% or 0% to 35% outdoor air entry.
- **Motorized Outdoor Air Damper** - The motorized outdoor air damper includes a slide-in/plug-in damper assembly with an outdoor air hood and filters. The outdoor air dampers open to the preset position when the indoor fan motor is energized. The damper has a range of 0% to 100% outdoor air entry. Factory installed option or field installed accessory.
- **Smoke Detectors** - The smoke detectors stop operation of the unit by interrupting power to the control board if smoke is detected within the air compartment.
- **CO<sub>2</sub> Sensor** - Senses CO<sub>2</sub> levels and automatically overrides the economizer when levels rise above the preset limits.
- **Dirty Filter Switch** - This kit includes a differential pressure switch that energizes the fault light on the unit thermostat, indicating that there is an abnormally high pressure drop across the filters.
- **Coil Guard** - Field installed decorative wire coil guard.
- **Hail Guard** - This kit includes a sloped hood which installs over the outside condenser coil and prevents damage to the coil fins from hail strikes. Field installed accessory only.
- **Flue Exhaust Extension Kit** - In locations with wind or weather conditions which may interfere with proper exhausting of furnace combustion products, this kit can be installed to prevent the flue exhaust from entering nearby fresh air intakes.
- **-60°F Gas Heat Kit** - For installations which require gas heat units to perform in low ambient temperatures, a gas section heating kit is available. This kit provides electric heat in the gas heat controls section to ensure the gas valve and controls will continue to function properly at extremely low temperatures.
- **Gas Heat High Altitude Kit** - This kit converts a gas heat unit to operate at high altitudes, 2,000 to 6,000 feet. Conversion kits are available for natural gas and propane.
- **Gas Heat Propane Conversion Kit** - This kit converts a gas-fired heater from natural gas to propane. It contains the main burner orifices and gas valve replacement springs.
- **Gas Piping Kit** - Contains pipe nipples, fittings and gas cock required for gas supply connection with external shut off.
- **Electric Heaters** - The electric heaters range from 9 kW to 54kW and are available in all the voltage options of the base units. All heaters are dual staged. Cooling units include an adapter panel for easy installation of the electric heaters. Necessary hardware and connectors are included with the heaters. All heaters are intended for single point power supply.
- **Low Limit / Compressor Lockout Kit**
  1. **Compressor Lockout (CLO):** To prevent mechanical (compressorized) operation of the unit during cold outdoor conditions where there is a risk of returning liquid refrigerant back to the compressors.
  2. **Low Limit Control (LLC):** To prevent the supply air from dropping below a specified setpoint by utilizing the units first stage heating means when there is a demand for cooling during cold outside conditions.
- **Metal Frame Filter Kit** - Metal frame with polyester filter medium.
- **Permanent Filters** - Permanent filters are available.
- **Roof Curbs** - The roof curbs have insulated decks and are shipped disassembled. The roof curbs are available in 8" and 14" heights. For applications with security concerns, burglar bars are available for the duct openings of the roof curbs.
- **Roof Curb Transition - Single Piece Adapter (10" High)** - Roof curbs for transitioning from Sunline™ units to Predator® units. Fits 7.5 to 12.5 Sunline™ roof curbs only.
- **Burglar Bars** - Mount in the supply and return openings to prevent entry into the duct work.
- **Thermostat** - The units are designed to operate with 24-volt electronic and electro-mechanical thermostats. All units (with or without an economizer) operate with two-stage heat/two-stage cool or two-stage cooling only thermostats, depending upon unit configuration.



TABLE 1: ACCESSORIES

| Part Number | Description  | Weight   |
|-------------|--|----------|
| 1RC0470     | Roof Curb, 8" Height   | -        |
| 1RC0471     | Roof Curb, 14" Height  | -        |
| 1RC0472     | Roof Curb, Transition (7.5 T through 12.5 T)   | -        |
| 1BD0408     | Burglar Bars, Downflow   | -        |
| 2TP04520925 | Electric Heat 9kW 230V   | -        |
| 2TP04521825 | Electric Heat 18kW 230V  | -        |
| 2TP04522425 | Electric Heat 24kW 230V  | -        |
| 2TP04523625 | Electric Heat 36kW 230V  | -        |
| 2TP04525425 | Electric Heat 54kW 230V  | -        |
| 2TP04520946 | Electric Heat 9kW 460V   | -        |
| 2TP04521846 | Electric Heat 18kW 460V  | -        |
| 2TP04522446 | Electric Heat 24kW 460V  | -        |
| 2TP04523646 | Electric Heat 36kW 460V  | -        |
| 2TP04525446 | Electric Heat 54kW 460V  | -        |
| 2TP04520958 | Electric Heat 9kW 575V   | -        |
| 2TP04521858 | Electric Heat 18kW 575V  | -        |
| 2TP04522458 | Electric Heat 24kW 575V  | -        |
| 2TP04523658 | Electric Heat 36kW 575V  | -        |
| 2TP04525458 | Electric Heat 54kW 575V  | -        |
| 2TP04540925 | Electric Heat 9kW 230V, 42" Tall Cabinet   | -        |
| 2TP04541825 | Electric Heat 18kW 230V, 42" Tall Cabinet  | -        |
| 2TP04542425 | Electric Heat 24kW 230V, 42" Tall Cabinet  | -        |
| 2TP04543625 | Electric Heat 36kW 230V, 42" Tall Cabinet  | -        |
| 2TP04540946 | Electric Heat 9kW 460V, 42" Tall Cabinet   | -        |
| 2TP04541846 | Electric Heat 18kW 460V, 42" Tall Cabinet  | -        |
| 2TP04542446 | Electric Heat 24kW 460V, 42" Tall Cabinet  | -        |
| 2TP04543646 | Electric Heat 36kW 460V, 42" Tall Cabinet  | -        |
| 2TP04540958 | Electric Heat 9kW 575V, 42" Tall Cabinet   | -        |
| 2TP04541858 | Electric Heat 18kW 575V, 42" Tall Cabinet  | -        |
| 2TP04542458 | Electric Heat 24kW 575V, 42" Tall Cabinet  | -        |
| 2TP04543658 | Electric Heat 36kW 575V, 42" Tall Cabinet  | -        |
| 1FA0411     | Manual Outside Air Damper 0-35%, Downflow (Incl. Hood, Damper & Filters, No Barometric Relief)           | -        |
| 1FA0412     | Manual Outside Air Damper 0-100%, Downflow (Incl. Hood, Damper & Filters, No Barometric Relief)          | -        |
| 2MD04702724 | Motorized Damper, Downflow (Incl. Hood, Damper & Filter, no Barometric Relief)                           | -        |
| 2MD04703324 | Motorized Damper, Horizontal (Incl. Hood, Damper & Filter, no Barometric Relief)                         | -        |
| 2EE04705424 | Economizer, Downflow (Incl. Barometric Relief & All Hoods)   | 124 lbs. |
| 2EE04705524 | Economizer, Horizontal (Incl. Dampers & Hoods, no Barometric Relief)                                     | 97 lbs.  |
| 2EE04705224 | Economizer, Slab, Downflow (Incl. Dampers only no Hoods or Barometric Relief)                            | -        |
| 2EE04705624 | "Downflow Economizer, Slab type for ERV (no Barometric Relief or FA hood)", 42" Tall Cabinet             | -        |
| 2PE04703225 | Power Exhaust, Downflow, 230V (For Units with Economizer only)   | -        |
| 2PE04703246 | Power Exhaust, Downflow, 460V (For Units with Economizer only)   | -        |
| 2PE04703258 | Power Exhaust, Downflow, 580V (For Units with Economizer only)   | -        |
| 2EC04700924 | Dual Enthalpy Control (Use with Single Enthalpy Economizer)  | -        |
| 1EH0407     | Hood Kit, Downflow Economizer (Included with all Downflow Economizers)                                   | -        |
| 1RD0411     | Barometric Relief Kit, Ductmount for Horizontal Application (Incl. Damper & Hood)                        | -        |
| 1EH0408     | Barometric Relief Kit, Ductmount for Horizontal Application w/Power Exhaust (Incl. Damper & Hood)        | 25 lbs.  |
| 1EH0409     | Barometric Relief / Hood Kit, for Field Installed Slab Econ. w/o ERV (Incl. Barometric Relief & FA Hood) | -        |
| 2AQ04700424 | CO2 Detector Unit Mount  | -        |
| 2AQ04700324 | CO2 Detector Space Mount   | -        |
| 2SD04700424 | Smoke Detector, Supply or Return (Return Not Available with Horizontal Economizer)                       | -        |
| 2MK04700624 | Low Limit / Compressor Lockout Kit   | -        |
| 1CG0419     | Coil Guard (Electric / Electric & HP models)   | -        |

**TABLE 1: ACCESSORIES (CONTINUED)**

| <b>Part Number</b> | <b>Description</b>   | <b>Weight</b> |
|--------------------|--|---------------|
| 1CG0420            | Coil Guard (Gas / Electric models)                             | -             |
| 1CG0427            | Coil Guard (Electric / Electric & HP Models), 42" Tall Cabinet | -             |
| 1CG0428            | Coil Guard (Gas / Electric Models), 42" Tall Cabinet           | -             |
| 1HG0411            | Hail Guard Kit   | -             |
| 1HG0415            | Hail Guard Kit, 42" Tall Cabinet                               | -             |
| 1GP0405            | Gas Piping Kit   | -             |
| 1NP0442            | Propane Conversion Kit   | -             |
| 1HA0442            | High Altitude Kit for Natural Gas                              | -             |
| 1HA0443            | High Altitude Kit for Propane                                  | -             |
| 1FE0412            | Flue Exhaust Extension Kit                                     | -             |
| 2BC04700106        | Gas Heat Kit, -60 deg F, 230V                                  | -             |
| 2BC04700151        | Gas Heat Kit, -60 deg F, 460V                                  | -             |
| 2BC04700154        | Gas Heat Kit, -60 deg F, 575V                                  | -             |
| 1FL0402            | Permanent Filter Kit   | -             |
| 1FL0423            | Permanent Filter Kit, 42" Tall Cabinet                         | -             |
| 2DF0401            | Dirty Filter Switch  | -             |
| 1FF0410            | Filter Frame Kit, Metal  | -             |
| 1FF0411            | Metal Filter Frame Kit, 42" Tall Cabinet                       | -             |

# NOMENCLATURE

## 6.5-12.5 Ton York® Model Number Nomenclature

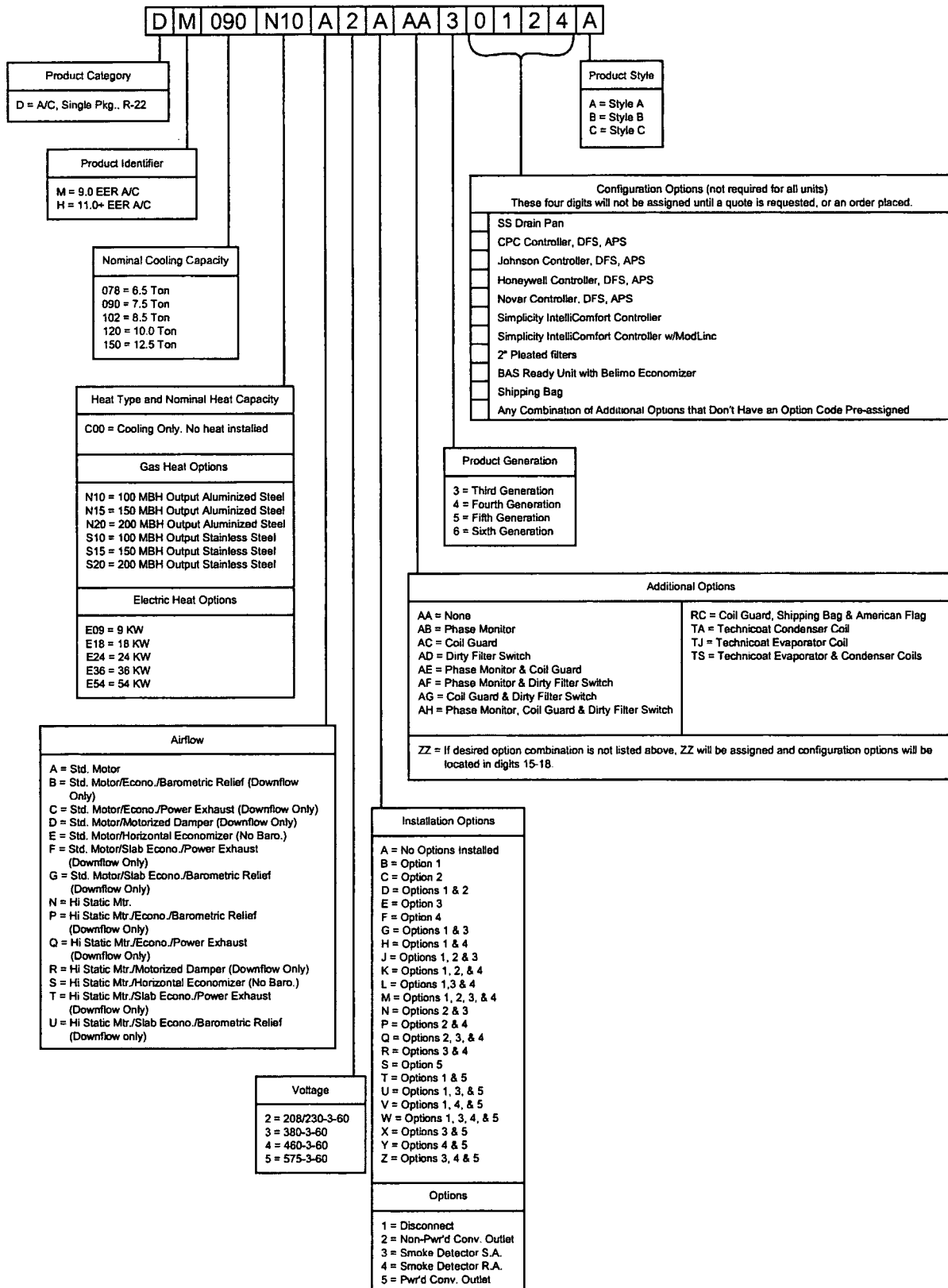


TABLE 2: DH PHYSICAL DATA

| Component                         |                                      | Models       |         |         |         |         |
|-----------------------------------|--------------------------------------|--------------|---------|---------|---------|---------|
|                                   |                                      | 078          | 090     | 102     | 120     | 150     |
| Evaporator Blower                 | Blower, Centrifugal (Dia. X Wd. in.) | 12 x 12      | 12 x 12 | 12 X 12 | 15 x 15 | 15 x 15 |
|                                   | Motor, Standard (HP)                 | 1-1/2        | 2       | 3       | 2       | 3       |
|                                   | Motor, Optional (HP)                 | 2            | 3       | 3       | 3       | 5       |
| Evaporator Coil                   | Rows                                 | 3            | 3       | 3       | 4       | 4       |
|                                   | Fins per Inch                        | 15           | 15      | 15      | 15      | 15      |
|                                   | Height (in.)                         | 32           | 32      | 32      | 40      | 40      |
|                                   | Face Area (ft. <sup>2</sup> each)    | 10.67        | 10.67   | 10.67   | 13.2    | 13.2    |
| Condenser Fan (2 per Unit)        | Propeller Dia. (in., each)           | 24           | 24      | 24      | 24      | 24      |
|                                   | Motor (HP, each)                     | 1/3          | 1/3     | 1/3     | 3/4     | 3/4     |
|                                   | CFM, Nominal (each)                  | 3400         | 3400    | 3400    | 4400    | 4400    |
| Condenser Coil (2 per unit)       | Rows (each)                          | Sys 1: 2 Row | 2       | 2       | 2       | 2       |
|                                   |                                      | Sys 2: 1 Row |         |         |         |         |
|                                   | Fins per Inch                        | 20           | 20      | 20      | 20      | 20      |
|                                   | Height (in., each)                   | 36           | 36      | 36      | 44      | 44      |
| Face Area (ft. <sup>2</sup> each) | 12                                   | 12           | 12      | 14.5    | 14.5    |         |
| Refrigerant Charge                | System 1 (lb./oz.)                   | 8/0          | 8/12    | 9/8     | 12/0    | 9/14    |
|                                   | System 2 (lb./oz.)                   | 4/12         | 9/0     | 8/2     | 11/0    | 9/4     |
| Compressors                       | Quantity                             | 2            | 2       | 2       | 2       | 2       |
|                                   | Type                                 | Recip.       | Recip   | Recip.  | Recip   | Scroll  |
| Air Filters                       | Size (Wd. x Ht. x Thickness in.)     | 25x16x2      | 25x16x2 | 25x16x2 | 25x20x2 | 25x20x2 |
|                                   | Number Per Unit                      | 4            | 4       | 4       | 4       | 4       |

TABLE 3: DH CAPACITY RATINGS

| Size<br>(Tons)  | Model            | Cooling Capacity<br>ARI Ratings <sup>1</sup> |      |       | CFM  | Sound<br>Rating<br>(dB) <sup>2</sup> | Nominal<br>Electric<br>Heat<br>Capacity <sup>3</sup><br>(kW) | Gas Heat Capacity |                 |                               |                       | Gas<br>Line<br>Size<br>(in. OD) |
|-----------------|------------------|--|------|-------|------|--------------------------------------|--|-------------------|-----------------|-------------------------------|-----------------------|---------------------------------|
|                 |                  | MBH  | EER  | IPLV  |      |                                      |  | Input<br>(MBH)    | Output<br>(MBH) | Seasonal<br>Efficiency<br>(%) | Temp.<br>Rise<br>(°F) |                                 |
| 078<br>(6-1/2)  | Cooling<br>Only  |  |      |       |      |                                      | -  | -                 | -               | -                             | -                     | -                               |
|                 | Electric<br>Heat | 75   | 11.5 | 11.90 | 2421 | 84                                   | 9, 18, 24,<br>36   | -                 | -               | -                             | -                     | -                               |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 120               | 96              | 80                            | 20-50                 | 3/4                             |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 180               | 144             | 80                            | 35-65                 | 3/4                             |
| 090<br>(7-1/2)  | Cooling<br>Only  |  |      |       |      |                                      | -  | -                 | -               | -                             | -                     | -                               |
|                 | Electric<br>Heat | 89   | 11.5 | 12.0  | 3000 | 84                                   | 18, 36   | -                 | -               | -                             | -                     | -                               |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 120               | 96              | 80                            | 15-45                 | 3/4                             |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 180               | 144             | 80                            | 30-60                 | 3/4                             |
| 102<br>(8-1/2)  | Cooling<br>Only  |  |      |       |      |                                      | -  | -                 | -               | -                             | -                     | -                               |
|                 | Electric<br>Heat | 99   | 11.0 | 11.50 | 2692 | 84                                   | 9, 18, 24,<br>36   | -                 | -               | -                             | -                     | -                               |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 120               | 96              | 80                            | 15-45                 | 3/4                             |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 180               | 144             | 80                            | 30-60                 | 3/4                             |
| 120<br>(10)     | Cooling<br>Only  |  |      |       |      |                                      | -  | -                 | -               | -                             | -                     | -                               |
|                 | Electric<br>Heat | 115  | 11.0 | 11.70 | 3840 | 90                                   | 18, 24, 36,<br>54  | -                 | -               | -                             | -                     | -                               |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 180               | 144             | 80                            | 20-50                 | 3/4                             |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 240               | 192             | 80                            | 35-65                 | 3/4                             |
| 150<br>(12-1/2) | Cooling<br>Only  |  |      |       |      |                                      | -  | -                 | -               | -                             | -                     | -                               |
|                 | Electric<br>Heat | 146  | 10.0 | 10.70 | 4100 | 90                                   | 18, 24, 36,<br>54  | -                 | -               | -                             | -                     | -                               |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 180               | 144             | 80                            | 10-40                 | 3/4                             |
|                 | Gas Heat         |  |      |       |      |                                      | -  | 240               | 192             | 80                            | 25-55                 | 3/4                             |

1 Rated at 95°F ambient 80°F dry bulb and 67°F wet bulb.

2 Rated in accordance with ARI 270 standard.

3 See Table 20.

TABLE 4: UNIT VOLTAGE LIMITATIONS

| POWER RATING | MIN. | MAX. |
|--------------|------|------|
| 208/230-3-60 | 187  | 252  |
| 460-3-60     | 432  | 504  |
| 575-3-60     | 540  | 630  |

**TABLE 5: COOLING CAPACITY DH078 (6-1/2 TON) UNIT**

| Air On Evap. Coil                          |         | Temperature of Air on Condenser Coil 75°F |                              |  |      |      |      |      |      |      | Temperature of Air on Condenser Coil 85°F  |                              |                              |  |      |      |      |      |      |  |  |
|--|---------|---|------------------------------|--|------|------|------|------|------|------|--|------------------------------|------------------------------|--|------|------|------|------|------|--|--|
| CFM  | WB (°F) | Tot. Cap. <sup>1</sup> (MBH)              | Tot. Input <sup>2</sup> (kW) | Sensible Capacity (MBH) <sup>*</sup><br>Return Dry Bulb (°F) |      |      |      |      |      |      |  | Tot. Cap. <sup>1</sup> (MBH) | Tot. Input <sup>2</sup> (kW) | Sensible Capacity (MBH) <sup>*</sup><br>Return Dry Bulb (°F) |      |      |      |      |      |  |  |
|  |         |   |                              | 86   | 83   | 80   | 77   | 74   | 71   | 68   | 86   |                              |                              | 83   | 80   | 77   | 74   | 71   | 68   |  |  |
| 1950                                       | 72      | 88.9                                      | 4.8                          | 51.3   | 45.8 | 40.2 | 34.6 | 29.1 | -    | -    | 84.6                                       | 5.3                          | 49.4                         | 43.9   | 38.3 | 32.7 | 27.2 | -    | -    |  |  |
|  | 67      | 85.5                                      | 4.8                          | 65.4   | 59.9 | 54.3 | 48.7 | 43.2 | 37.6 | 32.1 | 79.8                                       | 5.2                          | 62.9                         | 57.4   | 51.8 | 46.2 | 40.7 | 35.1 | 29.6 |  |  |
|  | 62      | 80.0                                      | 4.7                          | 80.0   | 73.8 | 68.2 | 62.7 | 57.1 | 51.5 | 46.0 | 74.2                                       | 5.1                          | 74.2                         | 69.8   | 64.3 | 58.7 | 53.1 | 47.6 | 42.0 |  |  |
| 2275                                       | 72      | 91.3                                      | 4.8                          | 56.3   | 49.7 | 43.2 | 36.6 | 30.0 | -    | -    | 87.1                                       | 5.3                          | 54.5                         | 47.9   | 41.4 | 34.8 | 28.2 | -    | -    |  |  |
|  | 67      | 87.9                                      | 4.8                          | 71.4   | 64.9 | 58.3 | 51.7 | 45.1 | 38.6 | 32.0 | 82.2                                       | 5.3                          | 69.1                         | 62.5   | 56.0 | 49.4 | 42.8 | 36.2 | 29.7 |  |  |
|  | 62      | 82.2                                      | 4.7                          | 82.2   | 79.1 | 73.3 | 66.7 | 60.1 | 53.5 | 47.0 | 76.4                                       | 5.2                          | 76.4                         | 74.2   | 69.4 | 62.8 | 56.3 | 49.7 | 43.1 |  |  |
| 2600                                       | 72      | 93.8                                      | 4.8                          | 61.3   | 53.7 | 46.1 | 38.5 | 30.9 | -    | -    | 89.6                                       | 5.4                          | 59.6                         | 52.0   | 44.4 | 36.9 | 29.3 | -    | -    |  |  |
|  | 67      | 90.2                                      | 4.8                          | 77.4   | 69.9 | 62.3 | 54.7 | 47.1 | 39.5 | 31.9 | 84.5                                       | 5.3                          | 75.3                         | 67.7   | 60.1 | 52.5 | 44.9 | 37.4 | 29.8 |  |  |
|  | 62      | 84.4                                      | 4.8                          | 84.4   | 84.4 | 78.3 | 70.7 | 63.1 | 55.5 | 47.9 | 78.6                                       | 5.2                          | 78.6                         | 78.6   | 74.6 | 67.0 | 59.4 | 51.8 | 44.2 |  |  |
| 2925                                       | 72      | 94.5                                      | 4.8                          | 65.3   | 56.6 | 48.0 | 39.4 | 30.7 | -    | -    | 90.5                                       | 5.4                          | 63.7                         | 55.1   | 46.5 | 37.8 | 29.2 | -    | -    |  |  |
|  | 67      | 90.9                                      | 4.8                          | 83.2   | 73.5 | 64.8 | 56.2 | 47.6 | 38.9 | 30.3 | 85.4                                       | 5.3                          | 80.1                         | 71.5   | 62.8 | 54.2 | 45.6 | 36.9 | 28.3 |  |  |
|  | 62      | 85.0                                      | 4.8                          | 85.0   | 85.0 | 82.0 | 73.3 | 64.7 | 56.0 | 47.4 | 79.4                                       | 5.2                          | 79.4                         | 79.4   | 77.4 | 68.8 | 60.1 | 51.5 | 42.9 |  |  |
| 3250                                       | 72      | 95.1                                      | 4.9                          | 69.3   | 59.6 | 49.9 | 40.2 | 30.5 | -    | -    | 91.4                                       | 5.4                          | 67.8                         | 58.2   | 48.5 | 38.8 | 29.1 | -    | -    |  |  |
|  | 67      | 91.5                                      | 4.8                          | 88.9   | 77.1 | 67.4 | 57.7 | 48.0 | 38.3 | 28.6 | 86.3                                       | 5.3                          | 84.9                         | 75.2   | 65.6 | 55.9 | 46.2 | 36.5 | 26.8 |  |  |
|  | 62      | 85.6                                      | 4.8                          | 85.6   | 85.6 | 85.6 | 75.9 | 66.3 | 56.6 | 46.9 | 80.2                                       | 5.2                          | 80.2                         | 80.2   | 80.2 | 70.6 | 60.9 | 51.2 | 41.5 |  |  |
| 57   | 83.7    | 4.7                                       | 83.7                         | 83.7   | 83.7 | 74.0 | 64.4 | 54.7 | 45.0 | 79.0 | 5.2  | 79.0                         | 79.0                         | 79.0   | 69.3 | 59.6 | 49.9 | 40.2 |      |  |  |
| Temperature of Air on Condenser Coil 95°F  |         |   |                              |  |      |      |      |      |      |      | Temperature of Air on Condenser Coil 105°F |                              |                              |  |      |      |      |      |      |  |  |
| 1950                                       | 72      | 80.3                                      | 5.8                          | 47.5   | 42.0 | 36.4 | 30.8 | 25.3 | -    | -    | 74.6                                       | 6.3                          | 45.1                         | 39.6   | 34.0 | 28.5 | 22.9 | -    | -    |  |  |
|  | 67      | 74.1                                      | 5.7                          | 60.4   | 54.9 | 49.3 | 43.7 | 38.2 | 32.6 | 27.1 | 67.4                                       | 6.1                          | 57.6                         | 52.1   | 46.5 | 40.9 | 35.4 | 29.8 | 24.3 |  |  |
|  | 62      | 68.5                                      | 5.6                          | 68.5   | 65.8 | 60.3 | 54.7 | 49.2 | 43.6 | 38.0 | 63.3                                       | 6.0                          | 63.3                         | 60.8   | 55.2 | 49.7 | 44.1 | 38.6 | 33.0 |  |  |
| 2275                                       | 72      | 82.8                                      | 5.8                          | 52.7   | 46.2 | 39.6 | 33.0 | 26.4 | -    | -    | 76.8                                       | 6.3                          | 50.2                         | 43.7   | 37.1 | 30.5 | 23.9 | -    | -    |  |  |
|  | 67      | 76.5                                      | 5.7                          | 66.8   | 60.2 | 53.6 | 47.0 | 40.5 | 33.9 | 27.3 | 69.4                                       | 6.2                          | 63.0                         | 57.3   | 50.7 | 44.1 | 37.6 | 31.0 | 24.4 |  |  |
|  | 62      | 70.7                                      | 5.6                          | 70.7   | 69.4 | 65.6 | 59.0 | 52.4 | 45.8 | 39.3 | 65.2                                       | 6.1                          | 65.2                         | 63.9   | 60.2 | 53.7 | 47.1 | 40.5 | 33.9 |  |  |
| 2600                                       | 72      | 85.4                                      | 5.9                          | 57.9   | 50.4 | 42.8 | 35.2 | 27.6 | -    | -    | 78.9                                       | 6.4                          | 55.3                         | 47.7   | 40.2 | 32.6 | 25.0 | -    | -    |  |  |
|  | 67      | 78.8                                      | 5.8                          | 73.1   | 65.5 | 57.9 | 50.4 | 42.8 | 35.2 | 27.6 | 71.3                                       | 6.2                          | 68.5                         | 62.5   | 54.9 | 47.3 | 39.7 | 32.2 | 24.6 |  |  |
|  | 62      | 72.9                                      | 5.7                          | 72.9   | 72.9 | 70.8 | 63.2 | 55.7 | 48.1 | 40.5 | 67.0                                       | 6.1                          | 67.0                         | 67.0   | 65.2 | 57.6 | 50.1 | 42.5 | 34.9 |  |  |
| 2925                                       | 72      | 86.5                                      | 5.9                          | 62.2   | 53.6 | 44.9 | 36.3 | 27.6 | -    | -    | 80.0                                       | 6.4                          | 59.6                         | 50.9   | 42.3 | 33.7 | 25.0 | -    | -    |  |  |
|  | 67      | 79.9                                      | 5.8                          | 77.0   | 69.5 | 60.8 | 52.2 | 43.6 | 34.9 | 26.3 | 72.3                                       | 6.3                          | 70.8                         | 66.0   | 57.8 | 49.2 | 40.6 | 31.9 | 23.3 |  |  |
|  | 62      | 73.9                                      | 5.7                          | 73.9   | 73.9 | 72.8 | 64.2 | 55.6 | 46.9 | 38.3 | 67.9                                       | 6.2                          | 67.9                         | 67.9   | 67.0 | 58.4 | 49.7 | 41.1 | 32.5 |  |  |
| 3250                                       | 72      | 87.7                                      | 5.9                          | 66.4   | 56.7 | 47.1 | 37.4 | 27.7 | -    | -    | 81.0                                       | 6.4                          | 63.8                         | 54.1   | 44.4 | 34.8 | 25.1 | -    | -    |  |  |
|  | 67      | 81.0                                      | 5.8                          | 81.0   | 73.4 | 63.7 | 54.0 | 44.4 | 34.7 | 25.0 | 73.2                                       | 6.3                          | 73.2                         | 69.4   | 60.8 | 51.1 | 41.4 | 31.7 | 22.0 |  |  |
|  | 62      | 74.9                                      | 5.7                          | 74.9   | 74.9 | 74.9 | 65.2 | 55.5 | 45.8 | 36.1 | 68.8                                       | 6.2                          | 68.8                         | 68.8   | 68.8 | 59.1 | 49.4 | 39.7 | 30.0 |  |  |
| 57   | 74.2    | 5.7                                       | 74.2                         | 74.2   | 74.2 | 64.5 | 54.9 | 45.2 | 35.5 | 68.4 | 6.2  | 68.4                         | 68.4                         | 68.4   | 58.7 | 49.0 | 39.3 | 29.6 |      |  |  |
| Temperature of Air on Condenser Coil 115°F |         |   |                              |  |      |      |      |      |      |      | Temperature of Air on Condenser Coil 125°F |                              |                              |  |      |      |      |      |      |  |  |
| 1950                                       | 72      | 69.0                                      | 6.8                          | 42.8   | 37.2 | 31.6 | 26.1 | 20.5 | -    | -    | 63.3                                       | 7.3                          | 40.4                         | 34.8   | 29.2 | 23.7 | 18.1 | -    | -    |  |  |
|  | 67      | 60.7                                      | 6.6                          | 54.8   | 49.3 | 43.7 | 38.2 | 32.6 | 27.0 | 21.5 | 54.0                                       | 7.1                          | 52.0                         | 46.5   | 40.9 | 35.4 | 29.8 | 24.2 | 18.7 |  |  |
|  | 62      | 58.2                                      | 6.5                          | 58.2   | 55.8 | 50.2 | 44.7 | 39.1 | 33.5 | 28.0 | 53.0                                       | 7.0                          | 53.0                         | 50.7   | 45.2 | 39.6 | 34.1 | 28.5 | 23.0 |  |  |
| 2275                                       | 72      | 70.7                                      | 6.8                          | 47.7   | 41.2 | 34.6 | 28.0 | 21.4 | -    | -    | 64.6                                       | 7.4                          | 45.2                         | 38.7   | 32.1 | 25.5 | 18.9 | -    | -    |  |  |
|  | 67      | 62.3                                      | 6.7                          | 59.3   | 54.4 | 47.8 | 41.2 | 34.7 | 28.1 | 21.5 | 55.2                                       | 7.1                          | 55.2                         | 51.5   | 44.9 | 38.3 | 31.8 | 25.2 | 18.6 |  |  |
|  | 62      | 59.6                                      | 6.6                          | 59.6   | 58.5 | 54.9 | 48.3 | 41.8 | 35.2 | 28.6 | 54.1                                       | 7.1                          | 54.1                         | 53.0   | 49.6 | 43.0 | 36.4 | 29.9 | 23.3 |  |  |
| 2600                                       | 72      | 72.5                                      | 6.9                          | 52.7   | 45.1 | 37.5 | 30.0 | 22.4 | -    | -    | 66.0                                       | 7.4                          | 50.1                         | 42.5   | 34.9 | 27.3 | 19.8 | -    | -    |  |  |
|  | 67      | 63.8                                      | 6.7                          | 63.8   | 59.5 | 51.9 | 44.3 | 36.7 | 29.1 | 21.6 | 56.3                                       | 7.2                          | 56.3                         | 56.3   | 48.9 | 41.3 | 33.7 | 26.1 | 18.5 |  |  |
|  | 62      | 61.1                                      | 6.6                          | 61.1   | 61.1 | 59.6 | 52.0 | 44.4 | 36.9 | 29.3 | 55.3                                       | 7.1                          | 55.3                         | 55.3   | 54.0 | 46.4 | 38.8 | 31.2 | 23.7 |  |  |
| 2925                                       | 72      | 73.4                                      | 6.9                          | 57.0   | 48.3 | 39.7 | 31.0 | 22.4 | -    | -    | 66.8                                       | 7.5                          | 54.3                         | 45.7   | 37.1 | 28.4 | 19.8 | -    | -    |  |  |
|  | 67      | 64.6                                      | 6.7                          | 64.6   | 62.5 | 54.8 | 46.2 | 37.6 | 28.9 | 20.3 | 57.0                                       | 7.2                          | 57.0                         | 57.0   | 51.8 | 43.2 | 34.6 | 25.9 | 17.3 |  |  |
|  | 62      | 61.9                                      | 6.7                          | 61.9   | 61.9 | 61.2 | 52.5 | 43.9 | 35.2 | 26.6 | 55.9                                       | 7.1                          | 55.9                         | 55.9   | 55.3 | 46.7 | 38.0 | 29.4 | 20.8 |  |  |
| 3250                                       | 72      | 74.3                                      | 7.0                          | 61.2   | 51.5 | 41.8 | 32.1 | 22.4 | -    | -    | 67.6                                       | 7.5                          | 58.6                         | 48.9   | 39.2 | 29.5 | 19.8 | -    | -    |  |  |
|  | 67      | 65.5                                      | 6.8                          | 65.5   | 65.5 | 57.8 | 48.1 | 38.4 | 28.7 | 19.0 | 57.7                                       | 7.3                          | 57.7                         | 57.7   | 54.8 | 45.1 | 35.5 | 25.8 | 16.1 |  |  |
|  | 62      | 62.7                                      | 6.7                          | 62.7   | 62.7 | 62.7 | 53.0 | 43.3 | 33.6 | 23.9 | 56.6                                       | 7.2                          | 56.6                         | 56.6   | 56.6 | 46.9 | 37.2 | 27.6 | 17.9 |  |  |
| 57   | 62.5    | 6.8                                       | 62.5                         | 62.5   | 62.5 | 52.8 | 43.1 | 33.4 | 23.7 | 56.6 | 7.3  | 56.6                         | 56.6                         | 56.6   | 46.9 | 37.2 | 27.6 | 17.9 |      |  |  |

1 These capacities are gross ratings. For net capacity, deduct air blower motor, MBh = 3.415 x kW. Refer to the appropriate Blower Performance Table for the kW of the supply air blower motor.  
 2 These ratings include the condenser fan motors (total 1 kW) and the compressor motors but not the supply air blower motor.

**TABLE 6: COOLING CAPACITY DH090 (7-1/2 TON) UNIT**

| Air On Evap. Coil                          |         | Temperature of Air on Condenser Coil 75°F |                              |  |       |       |      |      |      |      | Temperature of Air on Condenser Coil 85°F  |                              |                              |  |      |      |      |      |      |  |  |
|--|---------|---|------------------------------|--|-------|-------|------|------|------|------|--|------------------------------|------------------------------|--|------|------|------|------|------|--|--|
| CFM  | WB (°F) | Tot. Cap. <sup>1</sup> (MBH)              | Tot. Input <sup>2</sup> (kW) | Sensible Capacity (MBH) <sup>1</sup><br>Return Dry Bulb (°F) |       |       |      |      |      |      |  | Tot. Cap. <sup>1</sup> (MBH) | Tot. Input <sup>2</sup> (kW) | Sensible Capacity (MBH) <sup>1</sup><br>Return Dry Bulb (°F) |      |      |      |      |      |  |  |
|  |         |   |                              | 86   | 83    | 80    | 77   | 74   | 71   | 68   | 86   |                              |                              | 83   | 80   | 77   | 74   | 71   | 68   |  |  |
| 2250                                       | 72      | 102.7                                     | 5.7                          | 60.1   | 53.7  | 47.3  | 40.9 | 34.5 | -    | -    | 98.5                                       | 6.2                          | 58.2                         | 51.8   | 45.4 | 39.0 | 32.5 | -    | -    |  |  |
|  | 67      | 98.7                                      | 5.6                          | 75.6   | 69.2  | 62.8  | 56.4 | 50.0 | 43.5 | 37.1 | 93.0                                       | 6.1                          | 73.4                         | 67.0   | 60.5 | 54.1 | 47.7 | 41.3 | 34.9 |  |  |
|  | 62      | 95.0                                      | 5.6                          | 95.0   | 87.3  | 80.9  | 74.5 | 68.0 | 61.6 | 55.2 | 88.7                                       | 6.1                          | 88.7                         | 82.4   | 76.0 | 69.6 | 63.2 | 56.8 | 50.4 |  |  |
|  | 57      | 96.7                                      | 5.5                          | 96.7   | 90.6  | 84.1  | 77.7 | 71.3 | 64.9 | 58.5 | 88.4                                       | 6.0                          | 88.4                         | 84.3   | 77.9 | 71.5 | 65.0 | 58.6 | 52.2 |  |  |
| 2625                                       | 72      | 105.1                                     | 5.7                          | 65.5   | 57.9  | 50.3  | 42.8 | 35.2 | -    | -    | 100.9                                      | 6.2                          | 63.8                         | 56.2   | 48.6 | 41.1 | 33.5 | -    | -    |  |  |
|  | 67      | 101.0                                     | 5.6                          | 82.0   | 74.4  | 66.8  | 59.2 | 51.6 | 44.0 | 36.5 | 95.2                                       | 6.1                          | 80.1                         | 72.5   | 64.9 | 57.3 | 49.7 | 42.2 | 34.6 |  |  |
|  | 62      | 97.2                                      | 5.6                          | 97.2   | 93.4  | 86.1  | 78.5 | 70.9 | 63.3 | 55.7 | 90.8                                       | 6.1                          | 90.8                         | 87.7   | 81.5 | 73.9 | 66.3 | 58.8 | 51.2 |  |  |
|  | 57      | 98.9                                      | 5.5                          | 98.9   | 95.9  | 89.6  | 82.0 | 74.4 | 66.8 | 59.2 | 90.5                                       | 6.1                          | 90.5                         | 88.5   | 83.5 | 75.9 | 68.3 | 60.7 | 53.2 |  |  |
| 3000                                       | 72      | 107.5                                     | 5.7                          | 70.9   | 62.1  | 53.4  | 44.6 | 35.9 | -    | -    | 103.2                                      | 6.3                          | 69.4                         | 60.7   | 51.9 | 43.2 | 34.4 | -    | -    |  |  |
|  | 67      | 103.3                                     | 5.6                          | 88.3   | 79.5  | 70.8  | 62.0 | 53.3 | 44.5 | 35.8 | 97.4                                       | 6.2                          | 86.8                         | 78.0   | 69.3 | 60.5 | 51.8 | 43.0 | 34.3 |  |  |
|  | 62      | 99.4                                      | 5.6                          | 99.4   | 99.4  | 91.2  | 82.5 | 73.8 | 65.0 | 56.3 | 92.9                                       | 6.1                          | 92.9                         | 92.9   | 87.0 | 78.2 | 69.5 | 60.7 | 52.0 |  |  |
|  | 57      | 101.2                                     | 5.5                          | 101.2  | 101.2 | 95.0  | 86.2 | 77.5 | 68.7 | 60.0 | 92.6                                       | 6.1                          | 92.6                         | 92.6   | 89.1 | 80.3 | 71.6 | 62.8 | 54.1 |  |  |
| 3375                                       | 72      | 108.5                                     | 5.7                          | 75.3   | 65.4  | 55.4  | 45.4 | 35.5 | -    | -    | 104.6                                      | 6.3                          | 74.2                         | 64.3   | 54.3 | 44.3 | 34.4 | -    | -    |  |  |
|  | 67      | 104.3                                     | 5.6                          | 94.8   | 83.4  | 73.5  | 63.5 | 53.6 | 43.6 | 33.6 | 98.7                                       | 6.2                          | 92.4                         | 82.4   | 72.5 | 62.5 | 52.5 | 42.6 | 32.6 |  |  |
|  | 62      | 100.4                                     | 5.6                          | 100.4  | 100.4 | 95.9  | 85.9 | 76.0 | 66.0 | 56.0 | 94.2                                       | 6.1                          | 94.2                         | 94.2   | 91.0 | 81.0 | 71.0 | 61.1 | 51.1 |  |  |
|  | 57      | 102.2                                     | 5.5                          | 102.2  | 102.2 | 99.1  | 89.2 | 79.2 | 69.2 | 59.3 | 93.9                                       | 6.1                          | 93.9                         | 93.9   | 92.1 | 82.1 | 72.2 | 62.2 | 52.3 |  |  |
| 3750                                       | 72      | 109.6                                     | 5.7                          | 79.8   | 68.6  | 57.4  | 46.2 | 35.1 | -    | -    | 106.0                                      | 6.3                          | 79.0                         | 67.9   | 56.7 | 45.5 | 34.3 | -    | -    |  |  |
|  | 67      | 105.4                                     | 5.6                          | 101.3  | 87.3  | 76.2  | 65.0 | 53.8 | 42.6 | 31.5 | 100.1                                      | 6.2                          | 98.0                         | 86.8   | 75.6 | 64.5 | 53.3 | 42.1 | 30.9 |  |  |
|  | 62      | 101.4                                     | 5.6                          | 101.4  | 101.4 | 100.5 | 89.4 | 78.2 | 67.0 | 55.8 | 95.4                                       | 6.1                          | 95.4                         | 95.4   | 95.0 | 83.8 | 72.6 | 61.4 | 50.3 |  |  |
|  | 57      | 103.3                                     | 5.5                          | 103.3  | 103.3 | 103.3 | 92.1 | 80.9 | 69.7 | 58.6 | 95.1                                       | 6.1                          | 95.1                         | 95.1   | 95.1 | 83.9 | 72.8 | 61.6 | 50.4 |  |  |
| Temperature of Air on Condenser Coil 95°F  |         |   |                              |  |       |       |      |      |      |      | Temperature of Air on Condenser Coil 105°F |                              |                              |  |      |      |      |      |      |  |  |
| 2250                                       | 72      | 94.3                                      | 6.7                          | 56.3   | 49.8  | 43.4  | 37.0 | 30.6 | -    | -    | 87.5                                       | 7.3                          | 53.7                         | 47.2   | 40.8 | 34.4 | 28.0 | -    | -    |  |  |
|  | 67      | 87.3                                      | 6.7                          | 71.1   | 64.7  | 58.3  | 51.9 | 45.5 | 39.1 | 32.7 | 79.7                                       | 7.2                          | 67.8                         | 61.4   | 55.0 | 48.6 | 42.2 | 35.8 | 29.4 |  |  |
|  | 62      | 82.4                                      | 6.5                          | 82.4   | 77.6  | 71.2  | 64.8 | 58.4 | 51.9 | 45.5 | 76.0                                       | 7.1                          | 76.0                         | 71.7   | 65.3 | 58.9 | 52.4 | 46.0 | 39.6 |  |  |
|  | 57      | 80.1                                      | 6.5                          | 80.1   | 78.0  | 71.6  | 65.2 | 58.8 | 52.4 | 46.0 | 74.0                                       | 7.1                          | 74.0                         | 72.0   | 65.6 | 59.2 | 52.7 | 46.3 | 39.9 |  |  |
| 2625                                       | 72      | 96.6                                      | 6.8                          | 62.1   | 54.5  | 46.9  | 39.4 | 31.8 | -    | -    | 89.8                                       | 7.4                          | 59.6                         | 52.0   | 44.4 | 36.8 | 29.3 | -    | -    |  |  |
|  | 67      | 89.4                                      | 6.7                          | 78.2   | 70.6  | 63.0  | 55.4 | 47.9 | 40.3 | 32.7 | 81.8                                       | 7.2                          | 74.3                         | 67.4   | 59.9 | 52.3 | 44.7 | 37.1 | 29.5 |  |  |
|  | 62      | 84.4                                      | 6.6                          | 84.4   | 82.0  | 76.9  | 69.4 | 61.8 | 54.2 | 46.6 | 78.0                                       | 7.1                          | 78.0                         | 75.8   | 71.0 | 63.4 | 55.8 | 48.3 | 40.7 |  |  |
|  | 57      | 82.1                                      | 6.6                          | 82.1   | 81.0  | 77.4  | 69.8 | 62.2 | 54.7 | 47.1 | 75.9                                       | 7.1                          | 75.9                         | 74.9   | 71.3 | 63.8 | 56.2 | 48.6 | 41.0 |  |  |
| 3000                                       | 72      | 98.9                                      | 6.8                          | 67.9   | 59.2  | 50.5  | 41.7 | 33.0 | -    | -    | 92.1                                       | 7.4                          | 65.5                         | 56.8   | 48.0 | 39.3 | 30.5 | -    | -    |  |  |
|  | 67      | 91.5                                      | 6.7                          | 85.2   | 76.5  | 67.7  | 59.0 | 50.2 | 41.5 | 32.8 | 83.8                                       | 7.3                          | 80.7                         | 73.5   | 64.7 | 56.0 | 47.2 | 38.5 | 29.7 |  |  |
|  | 62      | 86.4                                      | 6.6                          | 86.4   | 86.4  | 82.7  | 73.9 | 65.2 | 56.4 | 47.7 | 80.0                                       | 7.2                          | 80.0                         | 80.0   | 76.7 | 68.0 | 59.2 | 50.5 | 41.7 |  |  |
|  | 57      | 84.0                                      | 6.6                          | 84.0   | 84.0  | 83.2  | 74.4 | 65.7 | 57.0 | 48.2 | 77.8                                       | 7.2                          | 77.8                         | 77.8   | 77.1 | 68.3 | 59.6 | 50.8 | 42.1 |  |  |
| 3375                                       | 72      | 100.6                                     | 6.9                          | 73.1   | 63.2  | 53.2  | 43.2 | 33.3 | -    | -    | 93.4                                       | 7.4                          | 70.8                         | 60.8   | 50.8 | 40.9 | 30.9 | -    | -    |  |  |
|  | 67      | 93.1                                      | 6.8                          | 90.0   | 81.4  | 71.4  | 61.5 | 51.5 | 41.5 | 31.6 | 85.1                                       | 7.3                          | 83.5                         | 77.8   | 68.5 | 58.6 | 48.6 | 38.6 | 28.7 |  |  |
|  | 62      | 87.9                                      | 6.7                          | 87.9   | 87.9  | 86.1  | 76.1 | 66.1 | 56.2 | 46.2 | 81.2                                       | 7.2                          | 81.2                         | 81.2   | 79.6 | 69.6 | 59.6 | 49.7 | 39.7 |  |  |
|  | 57      | 85.5                                      | 6.6                          | 85.5   | 85.5  | 85.1  | 75.1 | 65.2 | 55.2 | 45.2 | 79.0                                       | 7.2                          | 79.0                         | 79.0   | 78.6 | 68.7 | 58.7 | 48.7 | 38.8 |  |  |
| 3750                                       | 72      | 102.4                                     | 6.9                          | 78.3   | 67.1  | 55.9  | 44.8 | 33.6 | -    | -    | 94.8                                       | 7.5                          | 76.0                         | 64.9   | 53.7 | 42.5 | 31.3 | -    | -    |  |  |
|  | 67      | 94.7                                      | 6.8                          | 94.7   | 86.3  | 75.1  | 63.9 | 52.8 | 41.6 | 30.4 | 86.4                                       | 7.3                          | 86.4                         | 82.2   | 72.4 | 61.2 | 50.0 | 38.8 | 27.6 |  |  |
|  | 62      | 89.4                                      | 6.7                          | 89.4   | 89.4  | 89.4  | 78.2 | 67.1 | 55.9 | 44.7 | 82.4                                       | 7.2                          | 82.4                         | 82.4   | 82.4 | 71.2 | 60.0 | 48.9 | 37.7 |  |  |
|  | 57      | 87.0                                      | 6.7                          | 87.0   | 87.0  | 87.0  | 75.8 | 64.6 | 53.4 | 42.2 | 80.2                                       | 7.2                          | 80.2                         | 80.2   | 80.2 | 69.0 | 57.8 | 46.6 | 35.5 |  |  |
| Temperature of Air on Condenser Coil 115°F |         |   |                              |  |       |       |      |      |      |      | Temperature of Air on Condenser Coil 125°F |                              |                              |  |      |      |      |      |      |  |  |
| 2250                                       | 72      | 80.6                                      | 7.9                          | 51.1   | 44.6  | 38.2  | 31.8 | 25.4 | -    | -    | 73.7                                       | 8.4                          | 48.4                         | 42.0   | 35.6 | 29.2 | 22.8 | -    | -    |  |  |
|  | 67      | 72.0                                      | 7.7                          | 64.6   | 58.1  | 51.7  | 45.3 | 38.9 | 32.5 | 26.1 | 64.4                                       | 8.2                          | 61.3                         | 54.8   | 48.4 | 42.0 | 35.6 | 29.2 | 22.8 |  |  |
|  | 62      | 69.6                                      | 7.6                          | 69.6   | 65.8  | 59.4  | 52.9 | 46.5 | 40.1 | 33.7 | 63.2                                       | 8.1                          | 63.2                         | 59.9   | 53.5 | 47.0 | 40.6 | 34.2 | 27.8 |  |  |
|  | 57      | 67.8                                      | 7.6                          | 67.8   | 66.0  | 59.5  | 53.1 | 46.7 | 40.3 | 33.9 | 61.6                                       | 8.2                          | 61.6                         | 59.9   | 53.5 | 47.1 | 40.7 | 34.3 | 27.8 |  |  |
| 2625                                       | 72      | 82.9                                      | 7.9                          | 57.1   | 49.5  | 41.9  | 34.3 | 26.7 | -    | -    | 76.0                                       | 8.5                          | 54.5                         | 47.0   | 39.4 | 31.8 | 24.2 | -    | -    |  |  |
|  | 67      | 74.1                                      | 7.7                          | 70.3   | 64.3  | 56.7  | 49.1 | 41.5 | 34.0 | 26.4 | 66.4                                       | 8.2                          | 66.4                         | 61.1   | 53.5 | 46.0 | 38.4 | 30.8 | 23.2 |  |  |
|  | 62      | 71.6                                      | 7.7                          | 71.6   | 69.7  | 65.1  | 57.5 | 49.9 | 42.3 | 34.7 | 65.2                                       | 8.2                          | 65.2                         | 63.5   | 59.1 | 51.6 | 44.0 | 36.4 | 28.8 |  |  |
|  | 57      | 69.7                                      | 7.7                          | 69.7   | 68.8  | 65.3  | 57.7 | 50.1 | 42.5 | 34.9 | 63.5                                       | 8.2                          | 63.5                         | 62.7   | 59.2 | 51.6 | 44.0 | 36.4 | 28.9 |  |  |
| 3000                                       | 72      | 85.2                                      | 8.0                          | 63.1   | 54.3  | 45.6  | 36.8 | 28.1 | -    | -    | 78.3                                       | 8.5                          | 60.6                         | 51.9   | 43.1 | 34.4 | 25.6 | -    | -    |  |  |
|  | 67      | 76.1                                      | 7.8                          | 76.1   | 70.4  | 61.7  | 52.9 | 44.2 | 35.4 | 26.7 | 68.4                                       | 8.3                          | 68.4                         | 67.4   | 58.6 | 49.9 | 41.1 | 32.4 | 23.6 |  |  |
|  | 62      | 73.6                                      | 7.7                          | 73.6   | 73.6  | 70.8  | 62.0 | 53.3 | 44.5 | 35.8 | 67.2                                       | 8.2                          | 67.2                         | 67.2   | 64.8 | 56.1 | 47.3 | 38.6 | 29.8 |  |  |
|  | 57      | 71.6                                      | 7.7                          | 71.6   | 71.6  | 71.0  | 62.2 | 53.5 | 44.7 | 36.0 | 65.4                                       | 8.3                          | 65.4                         | 65.4   | 64.9 | 56.1 | 47.4 | 38.6 | 29.9 |  |  |
| 3375                                       | 72      | 86.2                                      | 8.0                          | 68.4   | 58.5  | 48.5  | 38.5 | 28.6 | -    | -    | 79.0                                       | 8.6                          | 66.1                         | 56.1   | 46.1 | 36.2 | 26.2 | -    | -    |  |  |
|  | 67      | 77.1                                      | 7.8                          | 77.1   | 74.2  | 65.6  | 55.7 | 45.7 | 35.7 | 25.8 | 69.0                                       | 8.4                          | 69.0                         | 69.0   | 62.7 | 52.8 | 42.8 | 32.8 | 22.9 |  |  |
|  | 62      | 74.5                                      | 7.7                          | 74.5   | 74.5  | 73.1  | 63.1 | 53.2 | 43.2 | 33.2 | 67.8                                       | 8.3                          | 67.8                         | 67.8   | 66.6 | 56.6 | 46.7 | 36.7 | 26.8 |  |  |
|  | 57      | 72.5                                      | 7.8                          | 72.5   | 72.5  | 72.2  | 62.2 | 52.3 | 42.3 | 32.3 | 66.0                                       | 8.3                          | 66.0                         | 66.0   | 65.8 | 55.8 | 45.8 | 35.9 | 25.9 |  |  |
| 3750                                       | 72      | 87.3                                      | 8.1                          | 73.8   | 62.6  | 51.4  | 40.2 | 29.1 | -    | -    | 79.7                                       | 8.7                          | 71.5                         | 60.3   | 49.2 | 38.0 | 26.8 | -    | -    |  |  |
|  | 67      | 78.0                                      | 7.9                          | 78.0   | 78.0  | 69.6  | 58.4 | 47.2 | 36.1 | 24.9 | 69.7                                       | 8.4                          | 69.7                         | 69.7   | 66.8 | 55.6 | 44.5 | 33.3 | 22.1 |  |  |
|  | 62      | 75.4                                      | 7.8                          | 75.4   | 75.4  | 75.4  | 64.2 | 53.0 | 41.9 | 30.7 | 68.4                                       | 8.3                          | 68.4                         | 68.4   | 68.4 | 57.2 | 46.0 | 34.8 | 23.7 |  |  |
|  | 57      | 73.4                                      | 7.8                          | 73.4   | 73.4  | 73.4  | 62.2 | 51.0 | 39.9 | 28.7 | 66.6                                       | 8.4                          | 66.6                         | 66.6   | 66.6 | 55.4 | 44.3 | 33.1 | 21.9 |  |  |

1 These capacities are gross ratings. For net capacity, deduct air blower motor, MBh = 3.415 x kW. Refer to the appropriate Blower Performance Table for the kW of the supply air blower motor.  
 2 These ratings include the condenser fan motors (total 1 kW) and the compressor motors but not the supply air blower motor.

**TABLE 7: COOLING CAPACITY DH102 (8-1/2 TON) UNIT**

| Air On Evap. Coil                          |         | Temperature of Air on Condenser Coil 75°F |                              |  |      |      |      |      |      |       | Temperature of Air on Condenser Coil 85°F  |                              |                              |  |      |      |      |      |      |  |  |
|--|---------|---|------------------------------|--|------|------|------|------|------|-------|--|------------------------------|------------------------------|--|------|------|------|------|------|--|--|
| CFM  | WB (°F) | Tot. Cap. <sup>1</sup> (MBH)              | Tot. Input <sup>2</sup> (kW) | Sensible Capacity (MBH) <sup>1</sup><br>Return Dry Bulb (°F) |      |      |      |      |      |       |  | Tot. Cap. <sup>1</sup> (MBH) | Tot. Input <sup>2</sup> (kW) | Sensible Capacity (MBH) <sup>1</sup><br>Return Dry Bulb (°F) |      |      |      |      |      |  |  |
|  |         |   |                              | 86   | 83   | 80   | 77   | 74   | 71   | 68    | 86   |                              |                              | 83   | 80   | 77   | 74   | 71   | 68   |  |  |
| 2550                                       | 72      | 117.0                                     | 1.8                          | 66.8   | 59.5 | 52.2 | 44.9 | 37.7 | -    | -     | 112.5                                      | 7.6                          | 64.3                         | 57.0   | 49.8 | 42.5 | 35.2 | -    | -    |  |  |
|  | 67      | 112.1                                     | 1.9                          | 85.1   | 77.8 | 70.5 | 63.2 | 56.0 | 48.7 | 41.4  | 106.1                                      | 7.5                          | 82.2                         | 74.9   | 67.7 | 60.4 | 53.1 | 45.8 | 38.6 |  |  |
|  | 62      | 104.1                                     | 2.0                          | 104.   | 99.2 | 92.0 | 84.7 | 77.4 | 70.2 | 62.9  | 98.1                                       | 7.4                          | 98.1                         | 93.4   | 86.1 | 78.8 | 71.6 | 64.3 | 57.0 |  |  |
| 2975                                       | 57      | 104.5                                     | 1.9                          | 104.   | 103. | 96.0 | 88.7 | 81.5 | 74.2 | 66.9  | 97.5                                       | 7.4                          | 97.5                         | 96.7   | 89.4 | 82.2 | 74.9 | 67.6 | 60.4 |  |  |
|  | 72      | 120.7                                     | 4.3                          | 72.7   | 64.1 | 55.5 | 46.9 | 38.3 | -    | -     | 116.0                                      | 7.6                          | 70.5                         | 61.9   | 53.3 | 44.7 | 36.1 | -    | -    |  |  |
|  | 67      | 115.7                                     | 4.3                          | 92.1   | 83.5 | 75.0 | 66.4 | 57.8 | 49.2 | 40.6  | 109.4                                      | 7.5                          | 89.6                         | 81.0   | 72.4 | 63.9 | 55.3 | 46.7 | 38.1 |  |  |
| 3400                                       | 62      | 107.5                                     | 4.4                          | 107.   | 105. | 97.8 | 89.2 | 80.6 | 72.0 | 63.4  | 101.1                                      | 7.4                          | 101.                         | 98.8   | 92.2 | 83.6 | 75.0 | 66.4 | 57.8 |  |  |
|  | 57      | 107.8                                     | 4.4                          | 107.   | 107. | 102. | 93.5 | 84.9 | 76.3 | 67.7  | 100.6                                      | 7.4                          | 100.                         | 100.   | 95.8 | 87.2 | 78.6 | 70.0 | 61.4 |  |  |
|  | 72      | 124.5                                     | 6.8                          | 78.6   | 68.7 | 58.8 | 48.9 | 39.0 | -    | -     | 119.6                                      | 7.6                          | 76.6                         | 66.7   | 56.8 | 46.9 | 37.0 | -    | -    |  |  |
| 3825                                       | 67      | 119.3                                     | 6.8                          | 99.2   | 89.3 | 79.4 | 69.5 | 59.6 | 49.6 | 39.7  | 112.7                                      | 7.5                          | 97.1                         | 87.1   | 77.2 | 67.3 | 57.4 | 47.5 | 37.6 |  |  |
|  | 62      | 110.8                                     | 6.9                          | 110.   | 110. | 103. | 93.7 | 83.8 | 73.9 | 63.9  | 104.2                                      | 7.4                          | 104.                         | 104.   | 98.3 | 88.4 | 78.5 | 68.6 | 58.6 |  |  |
|  | 57      | 111.2                                     | 6.8                          | 111.   | 111. | 108. | 98.3 | 88.3 | 78.4 | 68.5  | 103.7                                      | 7.4                          | 103.                         | 103.   | 102. | 92.2 | 82.3 | 72.4 | 62.4 |  |  |
| 4250                                       | 72      | 125.4                                     | 6.9                          | 83.4   | 72.2 | 60.9 | 49.6 | 38.3 | -    | -     | 120.8                                      | 7.7                          | 81.8                         | 70.5   | 59.2 | 47.9 | 36.6 | -    | -    |  |  |
|  | 67      | 120.2                                     | 6.9                          | 104.   | 93.5 | 82.2 | 70.9 | 59.6 | 48.3 | 37.0  | 113.9                                      | 7.6                          | 103.                         | 91.8   | 80.5 | 69.2 | 57.9 | 46.6 | 35.4 |  |  |
|  | 62      | 111.6                                     | 6.9                          | 111.   | 111. | 108. | 96.7 | 85.4 | 74.1 | 62.8  | 105.3                                      | 7.5                          | 105.                         | 105.   | 102. | 91.1 | 79.8 | 68.5 | 57.2 |  |  |
| 4250                                       | 57      | 112.0                                     | 6.9                          | 112.   | 112. | 110. | 99.2 | 87.9 | 76.6 | 65.3  | 104.7                                      | 7.5                          | 104.                         | 104.   | 104. | 92.7 | 81.4 | 70.1 | 58.8 |  |  |
|  | 72      | 126.3                                     | 6.9                          | 88.3   | 75.6 | 62.9 | 50.3 | 37.6 | -    | -     | 122.1                                      | 7.7                          | 87.0                         | 74.3   | 61.6 | 49.0 | 36.3 | -    | -    |  |  |
|  | 67      | 121.0                                     | 6.9                          | 110.   | 97.6 | 85.0 | 72.3 | 59.6 | 46.9 | 34.3  | 115.1                                      | 7.6                          | 109.                         | 96.5   | 83.8 | 71.1 | 58.5 | 45.8 | 33.1 |  |  |
| 62   | 112.4   | 7.0                                       | 112.                         | 112.   | 112. | 99.8 | 87.1 | 74.4 | 61.8 | 106.4 | 7.5  | 106.                         | 106.                         | 106.   | 93.8 | 81.1 | 68.4 | 55.8 |      |  |  |
| 57   | 112.8   | 6.9                                       | 112.                         | 112.   | 112. | 100. | 87.5 | 74.8 | 62.2 | 105.8 | 7.5  | 105.                         | 105.                         | 105.   | 93.2 | 80.5 | 67.8 | 55.2 |      |  |  |
| Temperature of Air on Condenser Coil 95°F  |         |   |                              |  |      |      |      |      |      |       | Temperature of Air on Condenser Coil 105°F |                              |                              |  |      |      |      |      |      |  |  |
| 2550                                       | 72      | 108.0                                     | 13.4                         | 61.8   | 54.6 | 47.3 | 40.0 | 32.8 | -    | -     | 99.4                                       | 11.5                         | 59.2                         | 52.0   | 44.7 | 37.4 | 30.2 | -    | -    |  |  |
|  | 67      | 100.0                                     | 13.1                         | 79.3   | 72.1 | 64.8 | 57.5 | 50.3 | 43.0 | 35.7  | 90.8                                       | 11.2                         | 75.4                         | 68.1   | 60.8 | 53.6 | 46.3 | 39.0 | 31.7 |  |  |
|  | 62      | 92.0                                      | 12.8                         | 92.0   | 87.5 | 80.3 | 73.0 | 65.7 | 58.5 | 51.2  | 82.0                                       | 11.0                         | 82.0                         | 79.8   | 72.7 | 65.4 | 58.2 | 50.9 | 43.6 |  |  |
| 2975                                       | 57      | 90.5                                      | 12.9                         | 90.5   | 90.2 | 82.9 | 75.6 | 68.3 | 61.1 | 53.8  | 83.3                                       | 11.1                         | 83.3                         | 82.3   | 75.1 | 67.8 | 60.5 | 53.2 | 46.0 |  |  |
|  | 72      | 111.3                                     | 10.9                         | 68.2   | 59.7 | 51.1 | 42.5 | 33.9 | -    | -     | 102.8                                      | 10.3                         | 65.7                         | 57.2   | 48.6 | 40.0 | 31.4 | -    | -    |  |  |
|  | 67      | 103.1                                     | 10.7                         | 87.1   | 78.5 | 69.9 | 61.4 | 52.8 | 44.2 | 35.6  | 93.9                                       | 10.0                         | 83.3                         | 74.7   | 66.1 | 57.5 | 48.9 | 40.3 | 31.7 |  |  |
| 3400                                       | 62      | 94.8                                      | 10.4                         | 94.8   | 92.6 | 86.6 | 78.0 | 69.4 | 60.9 | 52.3  | 84.8                                       | 9.8                          | 84.8                         | 83.7   | 79.0 | 70.4 | 61.8 | 53.2 | 44.6 |  |  |
|  | 57      | 93.3                                      | 10.5                         | 93.3   | 93.1 | 89.5 | 80.9 | 72.3 | 63.7 | 55.1  | 86.2                                       | 9.9                          | 86.2                         | 85.7   | 81.5 | 72.9 | 64.3 | 55.7 | 47.1 |  |  |
|  | 72      | 114.7                                     | 8.4                          | 74.6   | 64.7 | 54.8 | 44.9 | 35.0 | -    | -     | 106.2                                      | 9.1                          | 72.3                         | 62.3   | 52.4 | 42.5 | 32.6 | -    | -    |  |  |
| 3825                                       | 67      | 106.2                                     | 8.2                          | 94.9   | 85.0 | 75.1 | 65.2 | 55.3 | 45.3 | 35.4  | 97.0                                       | 8.9                          | 91.2                         | 81.2   | 71.3 | 61.4 | 51.5 | 41.6 | 31.7 |  |  |
|  | 62      | 97.7                                      | 8.0                          | 97.7   | 97.7 | 93.0 | 83.1 | 73.2 | 63.3 | 53.3  | 87.6                                       | 8.7                          | 87.6                         | 87.6   | 85.2 | 75.3 | 65.4 | 55.5 | 45.6 |  |  |
|  | 57      | 96.1                                      | 8.1                          | 96.1   | 96.1 | 96.0 | 86.1 | 76.2 | 66.3 | 56.4  | 89.1                                       | 8.7                          | 89.1                         | 89.1   | 88.0 | 78.1 | 68.1 | 58.2 | 48.3 |  |  |
| 4250                                       | 72      | 116.3                                     | 8.4                          | 80.2   | 68.9 | 57.6 | 46.3 | 35.0 | -    | -     | 107.6                                      | 9.1                          | 78.0                         | 66.7   | 55.4 | 44.1 | 32.9 | -    | -    |  |  |
|  | 67      | 107.7                                     | 8.3                          | 101.   | 90.2 | 78.9 | 67.6 | 56.3 | 45.0 | 33.7  | 98.2                                       | 8.9                          | 95.0                         | 86.7   | 75.4 | 64.1 | 52.8 | 41.6 | 30.3 |  |  |
|  | 62      | 99.1                                      | 8.1                          | 99.1   | 99.1 | 96.7 | 85.4 | 74.1 | 62.8 | 51.6  | 88.8                                       | 8.7                          | 88.8                         | 88.8   | 87.6 | 76.3 | 65.0 | 53.7 | 42.4 |  |  |
| 4250                                       | 57      | 97.5                                      | 8.1                          | 97.5   | 97.5 | 97.4 | 86.2 | 74.9 | 63.6 | 52.3  | 90.2                                       | 8.8                          | 90.2                         | 90.2   | 89.7 | 78.4 | 67.1 | 55.8 | 44.5 |  |  |
|  | 72      | 117.9                                     | 8.4                          | 85.7   | 73.0 | 60.3 | 47.7 | 35.0 | -    | -     | 108.9                                      | 9.2                          | 83.8                         | 71.1   | 58.5 | 45.8 | 33.1 | -    | -    |  |  |
|  | 67      | 109.2                                     | 8.3                          | 108.   | 95.3 | 82.7 | 70.0 | 57.3 | 44.7 | 32.0  | 99.5                                       | 8.9                          | 98.9                         | 92.2   | 79.5 | 66.9 | 54.2 | 41.5 | 28.9 |  |  |
| 62   | 100.5   | 8.1                                       | 100.                         | 100.   | 100. | 87.8 | 75.1 | 62.4 | 49.8 | 89.9  | 8.8  | 89.9                         | 89.9                         | 89.9   | 77.2 | 64.6 | 51.9 | 39.2 |      |  |  |
| 57   | 98.9    | 8.1                                       | 98.9                         | 98.9   | 98.9 | 86.2 | 73.5 | 60.8 | 48.2 | 91.3  | 8.8  | 91.3                         | 91.3                         | 91.3   | 78.7 | 66.0 | 53.3 | 40.7 |      |  |  |
| Temperature of Air on Condenser Coil 115°F |         |   |                              |  |      |      |      |      |      |       | Temperature of Air on Condenser Coil 125°F |                              |                              |  |      |      |      |      |      |  |  |
| 2550                                       | 72      | 90.8                                      | 9.6                          | 56.6   | 49.4 | 42.1 | 34.8 | 27.5 | -    | -     | 82.2                                       | 7.8                          | 54.0                         | 46.8   | 39.5 | 32.2 | 24.9 | -    | -    |  |  |
|  | 67      | 81.6                                      | 9.4                          | 71.4   | 64.1 | 56.8 | 49.6 | 42.3 | 35.0 | 27.8  | 72.3                                       | 7.5                          | 67.4                         | 60.1   | 52.9 | 45.6 | 38.3 | 31.0 | 23.8 |  |  |
|  | 62      | 72.1                                      | 9.2                          | 72.1   | 72.1 | 65.1 | 57.9 | 50.6 | 43.3 | 36.0  | 62.1                                       | 7.3                          | 62.1                         | 62.1   | 57.6 | 50.3 | 43.0 | 35.7 | 28.5 |  |  |
| 2975                                       | 57      | 76.2                                      | 9.3                          | 76.2   | 74.5 | 67.2 | 59.9 | 52.7 | 45.4 | 38.1  | 69.0                                       | 7.5                          | 69.0                         | 66.7   | 59.4 | 52.1 | 44.8 | 37.6 | 30.3 |  |  |
|  | 72      | 94.3                                      | 9.7                          | 63.3   | 54.7 | 46.1 | 37.5 | 28.9 | -    | -     | 85.8                                       | 9.1                          | 60.8                         | 52.2   | 43.6 | 35.0 | 26.4 | -    | -    |  |  |
|  | 67      | 84.7                                      | 9.4                          | 79.4   | 70.8 | 62.2 | 53.6 | 45.0 | 36.4 | 27.8  | 75.4                                       | 8.8                          | 75.4                         | 66.9   | 58.3 | 49.8 | 41.2 | 32.6 | 24.0 |  |  |
| 3400                                       | 62      | 74.8                                      | 9.2                          | 74.8   | 74.8 | 71.3 | 62.7 | 54.1 | 45.5 | 36.9  | 64.8                                       | 8.6                          | 64.8                         | 64.8   | 63.6 | 55.0 | 46.4 | 37.8 | 29.2 |  |  |
|  | 57      | 79.1                                      | 9.3                          | 79.1   | 78.2 | 73.6 | 65.0 | 56.4 | 47.8 | 39.2  | 71.9                                       | 8.8                          | 71.9                         | 70.8   | 65.6 | 57.0 | 48.4 | 39.8 | 31.3 |  |  |
|  | 72      | 97.7                                      | 9.8                          | 69.9   | 60.0 | 50.0 | 40.1 | 30.2 | -    | -     | 89.3                                       | 10.5                         | 67.5                         | 57.6   | 47.7 | 37.7 | 27.8 | -    | -    |  |  |
| 3825                                       | 67      | 87.8                                      | 9.5                          | 87.4   | 77.5 | 67.6 | 57.7 | 47.8 | 37.8 | 27.9  | 78.6                                       | 10.1                         | 78.6                         | 73.7   | 63.8 | 53.9 | 44.0 | 34.1 | 24.2 |  |  |
|  | 62      | 77.6                                      | 9.3                          | 77.6   | 77.6 | 77.4 | 67.5 | 57.6 | 47.7 | 37.8  | 67.5                                       | 9.9                          | 67.5                         | 67.5   | 67.5 | 59.7 | 49.8 | 39.9 | 30.0 |  |  |
|  | 57      | 82.0                                      | 9.4                          | 82.0   | 82.0 | 79.9 | 70.0 | 60.1 | 50.2 | 40.3  | 74.9                                       | 10.1                         | 74.9                         | 74.9   | 71.9 | 62.0 | 52.0 | 42.1 | 32.2 |  |  |
| 4250                                       | 72      | 98.8                                      | 9.8                          | 75.9   | 64.6 | 53.3 | 42.0 | 30.7 | -    | -     | 90.1                                       | 10.6                         | 73.7                         | 62.5   | 51.2 | 39.9 | 28.6 | -    | -    |  |  |
|  | 67      | 88.8                                      | 9.5                          | 88.6   | 83.3 | 72.0 | 60.7 | 49.4 | 38.1 | 26.8  | 79.3                                       | 10.2                         | 79.3                         | 79.3   | 68.5 | 57.2 | 46.0 | 34.7 | 23.4 |  |  |
|  | 62      | 78.5                                      | 9.4                          | 78.5   | 78.5 | 78.4 | 67.1 | 55.8 | 44.5 | 33.2  | 68.2                                       | 10.0                         | 68.2                         | 68.2   | 68.2 | 57.9 | 46.6 | 35.3 | 24.1 |  |  |
| 4250                                       | 57      | 82.9                                      | 9.5                          | 82.9   | 82.9 | 81.9 | 70.6 | 59.3 | 48.0 | 36.7  | 75.6                                       | 10.1                         | 75.6                         | 75.6   | 74.1 | 62.8 | 51.5 | 40.2 | 28.9 |  |  |
|  | 72      | 100.0                                     | 9.9                          | 81.9   | 69.2 | 56.6 | 43.9 | 31.2 | -    | -     | 91.0                                       | 10.6                         | 80.0                         | 67.3   | 54.7 | 42.0 | 29.3 | -    | -    |  |  |
|  | 67      | 89.8                                      | 9.6                          | 89.8   | 89.1 | 76.4 | 63.7 | 51.0 | 38.4 | 25.7  | 80.0                                       | 10.3                         | 80.0                         | 80.0   | 73.2 | 60.6 | 47.9 | 35.2 | 22.6 |  |  |
| 62   | 79.3    | 9.4                                       | 79.3                         | 79.3   | 79.3 | 66.7 | 54.0 | 41.3 | 28.7 | 68.8  | 10.1                                       | 68.8                         | 68.8                         | 68.8   | 56.1 | 43.5 | 30.8 | 18.1 |      |  |  |
| 57   | 83.8    | 9.5                                       | 83.8                         | 83.8   | 83.8 | 71.2 | 58.5 | 45.8 | 33.2 | 76.3  | 10.2                                       | 76.3                         | 76.3                         | 76.3   | 63.7 | 51.0 | 38.3 | 25.6 |      |  |  |

1 These capacities are gross ratings. For net capacity, deduct air blower motor, MBh = 3.415 x kW. Refer to the appropriate Blower Performance Table for the kW of the supply air blower motor.  
 2 These ratings include the condenser fan motors (total 1 kW) and the compressor motors but not the supply air blower motor.



**TABLE 8: COOLING CAPACITY DH120 (10 TON) UNIT**

| Air On Evap. Coil |  | Temperature of Air on Condenser Coil 85°F |                  |  |     |     |     |    |    |  | Temperature of Air on Condenser Coil 95°F |                  |                  |  |     |     |    |    |    |  |  |
|-------------------|--|---|------------------|--|-----|-----|-----|----|----|--|---|------------------|------------------|--|-----|-----|----|----|----|--|--|
| CFM               | WB (°F)                                    | Tot. Cap.* (MBH)                          | Tot. Input† (kW) | Sensible Capacity (MBH) <sup>†</sup><br>Return Dry Bulb (°F) |     |     |     |    |    |  |   | Tot. Cap.* (MBH) | Tot. Input† (kW) | Sensible Capacity (MBH) <sup>†</sup><br>Return Dry Bulb (°F) |     |     |    |    |    |  |  |
|                   |  |   |                  | 86   | 83  | 80  | 77  | 74 | 71 | 68   | 86  |                  |                  | 83   | 80  | 77  | 74 | 71 | 68 |  |  |
| 3000              | 72   | 136                                       | 8.8              | 79   | 71  | 62  | 53  | 45 | -  | -  | 126                                       | 9.4              | 79               | 70   | 61  | 53  | 44 | -  | -  |  |  |
|                   | 67   | 122                                       | 8.6              | 99   | 90  | 82  | 73  | 64 | 56 | 47   | 114                                       | 9.1              | 96               | 88   | 79  | 70  | 62 | 53 | 45 |  |  |
|                   | 62   | 110                                       | 8.3              | 110  | 107 | 98  | 89  | 81 | 72 | 64   | 108                                       | 9.0              | 108              | 106  | 97  | 89  | 80 | 72 | 63 |  |  |
| 3500              | 57   | 109                                       | 8.7              | 109  | 105 | 97  | 88  | 80 | 71 | 63   | 103                                       | 9.1              | 103              | 102  | 93  | 84  | 76 | 67 | 59 |  |  |
|                   | 72   | 140                                       | 8.9              | 88   | 78  | 68  | 58  | 48 | -  | -  | 130                                       | 9.5              | 87               | 77   | 67  | 57  | 47 | -  | -  |  |  |
|                   | 67   | 126                                       | 8.7              | 110  | 100 | 89  | 79  | 69 | 59 | 49   | 118                                       | 9.1              | 106              | 96   | 86  | 76  | 66 | 56 | 46 |  |  |
| 4000              | 62   | 114                                       | 8.4              | 114  | 112 | 107 | 97  | 87 | 77 | 67   | 112                                       | 9.0              | 112              | 111  | 106 | 96  | 86 | 76 | 65 |  |  |
|                   | 57   | 112                                       | 8.7              | 112  | 110 | 106 | 96  | 86 | 76 | 66   | 106                                       | 9.1              | 106              | 106  | 101 | 91  | 81 | 71 | 61 |  |  |
|                   | 72   | 144                                       | 9.0              | 97   | 86  | 74  | 62  | 51 | -  | -  | 134                                       | 9.5              | 96               | 84   | 72  | 61  | 49 | -  | -  |  |  |
| 4500              | 67   | 129                                       | 8.8              | 121  | 109 | 97  | 86  | 74 | 62 | 51   | 122                                       | 9.2              | 116              | 105  | 93  | 81  | 70 | 58 | 46 |  |  |
|                   | 62   | 117                                       | 8.5              | 117  | 117 | 117 | 105 | 93 | 82 | 70   | 115                                       | 9.1              | 115              | 115  | 115 | 103 | 91 | 80 | 68 |  |  |
|                   | 57   | 115                                       | 8.8              | 115  | 115 | 115 | 104 | 92 | 80 | 69   | 110                                       | 9.2              | 110              | 110  | 110 | 98  | 86 | 75 | 63 |  |  |
| 5000              | 72   | 151                                       | 9.1              | 106  | 93  | 80  | 66  | 53 | -  | -  | 139                                       | 9.6              | 105              | 92   | 78  | 65  | 52 | -  | -  |  |  |
|                   | 67   | 135                                       | 8.9              | 131  | 118 | 105 | 91  | 78 | 65 | 52   | 126                                       | 9.3              | 124              | 114  | 101 | 87  | 74 | 61 | 48 |  |  |
|                   | 62   | 122                                       | 8.6              | 122  | 122 | 122 | 109 | 96 | 82 | 69   | 120                                       | 9.2              | 120              | 120  | 119 | 106 | 93 | 79 | 66 |  |  |
| 3000              | 57   | 121                                       | 8.9              | 121  | 121 | 121 | 107 | 94 | 81 | 67   | 114                                       | 9.3              | 114              | 114  | 114 | 100 | 87 | 74 | 61 |  |  |
|                   | 72   | 157                                       | 9.2              | 115  | 100 | 85  | 70  | 55 | -  | -  | 144                                       | 9.7              | 114              | 99   | 84  | 69  | 54 | -  | -  |  |  |
|                   | 67   | 141                                       | 9.0              | 141  | 127 | 112 | 97  | 82 | 67 | 53   | 131                                       | 9.4              | 131              | 123  | 108 | 93  | 78 | 63 | 49 |  |  |
| 3500              | 62   | 128                                       | 8.7              | 128  | 128 | 128 | 113 | 98 | 83 | 68   | 124                                       | 9.3              | 124              | 124  | 124 | 109 | 94 | 79 | 64 |  |  |
|                   | 57   | 126                                       | 9.1              | 126  | 126 | 126 | 111 | 96 | 81 | 66   | 118                                       | 9.4              | 118              | 118  | 103 | 88  | 73 | 58 |    |  |  |
|                   | Temperature of Air on Condenser Coil 105°F |   |                  |  |     |     |     |    |    | Temperature of Air on Condenser Coil 115°F |   |                  |                  |  |     |     |    |    |    |  |  |
| 3000              | 72   | 116                                       | 9.9              | 74   | 66  | 57  | 49  | 40 | -  | -  | 106                                       | 10.4             | 70               | 61   | 53  | 44  | 36 | -  | -  |  |  |
|                   | 67   | 106                                       | 9.6              | 92   | 84  | 75  | 67  | 58 | 50 | 41   | 97  | 10.1             | 89               | 80   | 72  | 63  | 55 | 46 | 37 |  |  |
|                   | 62   | 98  | 9.4              | 98   | 97  | 88  | 80  | 71 | 63 | 54   | 88  | 9.7              | 88               | 88   | 80  | 71  | 63 | 54 | 46 |  |  |
| 3500              | 57   | 96  | 9.5              | 96   | 95  | 87  | 78  | 69 | 61 | 52   | 88  | 10.0             | 88               | 88   | 80  | 72  | 63 | 54 | 46 |  |  |
|                   | 72   | 120                                       | 10.0             | 82   | 72  | 62  | 52  | 42 | -  | -  | 110                                       | 10.5             | 78               | 68   | 58  | 47  | 37 | -  | -  |  |  |
|                   | 67   | 109                                       | 9.7              | 101  | 92  | 82  | 72  | 62 | 52 | 42   | 100                                       | 10.2             | 96               | 88   | 78  | 68  | 58 | 48 | 38 |  |  |
| 4000              | 62   | 101                                       | 9.4              | 101  | 101 | 96  | 86  | 76 | 66 | 56   | 91  | 9.8              | 91               | 91   | 87  | 77  | 67 | 57 | 47 |  |  |
|                   | 57   | 99  | 9.6              | 99   | 99  | 94  | 84  | 74 | 64 | 54   | 91  | 10.1             | 91               | 91   | 87  | 77  | 67 | 57 | 47 |  |  |
|                   | 72   | 124                                       | 10.1             | 91   | 79  | 67  | 56  | 44 | -  | -  | 114                                       | 10.6             | 86               | 74   | 62  | 51  | 39 | -  | -  |  |  |
| 4500              | 67   | 113                                       | 9.7              | 110  | 100 | 89  | 77  | 65 | 54 | 42   | 104                                       | 10.3             | 104              | 96   | 84  | 73  | 61 | 49 | 38 |  |  |
|                   | 62   | 105                                       | 9.5              | 105  | 105 | 104 | 93  | 81 | 69 | 58   | 94  | 9.9              | 94               | 94   | 94  | 82  | 71 | 59 | 47 |  |  |
|                   | 57   | 102                                       | 9.7              | 102  | 102 | 102 | 90  | 79 | 67 | 55   | 94  | 10.2             | 94               | 94   | 94  | 83  | 71 | 59 | 48 |  |  |
| 5000              | 72   | 126                                       | 10.1             | 99   | 86  | 73  | 60  | 46 | -  | -  | 114                                       | 10.6             | 94               | 81   | 68  | 54  | 41 | -  | -  |  |  |
|                   | 67   | 115                                       | 9.8              | 114  | 107 | 96  | 83  | 70 | 56 | 43   | 104                                       | 10.3             | 104              | 100  | 92  | 78  | 65 | 52 | 39 |  |  |
|                   | 62   | 107                                       | 9.6              | 107  | 107 | 107 | 93  | 80 | 67 | 54   | 94  | 10.0             | 94               | 94   | 94  | 81  | 68 | 54 | 41 |  |  |
| 3000              | 57   | 104                                       | 9.8              | 104  | 104 | 104 | 91  | 78 | 64 | 51   | 95  | 10.3             | 95               | 95   | 95  | 81  | 68 | 55 | 42 |  |  |
|                   | 72   | 129                                       | 10.2             | 108  | 93  | 79  | 64  | 49 | -  | -  | 114                                       | 10.7             | 103              | 88   | 73  | 58  | 43 | -  | -  |  |  |
|                   | 67   | 117                                       | 9.9              | 117  | 114 | 104 | 89  | 74 | 59 | 44   | 104                                       | 10.4             | 104              | 104  | 99  | 84  | 69 | 54 | 39 |  |  |
| 3500              | 62   | 109                                       | 9.7              | 109  | 109 | 109 | 94  | 79 | 64 | 50   | 94  | 10.0             | 94               | 94   | 94  | 80  | 65 | 50 | 35 |  |  |
|                   | 57   | 106                                       | 9.8              | 106  | 106 | 106 | 91  | 77 | 62 | 47   | 95  | 10.3             | 95               | 95   | 95  | 80  | 65 | 50 | 35 |  |  |
|                   | Temperature of Air on Condenser Coil 125°F |   |                  |  |     |     |     |    |    | Temperature of Air on Condenser Coil 135°F |   |                  |                  |  |     |     |    |    |    |  |  |
| 3000              | 72   | 97  | 10.8             | 66   | 57  | 48  | 40  | 31 | -  | -  |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 67   | 88  | 10.5             | 85   | 77  | 68  | 59  | 51 | 42 | 34   |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 62   | 78  | 10.1             | 78   | 78  | 71  | 63  | 54 | 45 | 37   |   |                  |                  |  |     |     |    |    |    |  |  |
| 3500              | 57   | 81  | 10.4             | 81   | 81  | 74  | 65  | 57 | 48 | 39   |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 72   | 100                                       | 11.0             | 73   | 63  | 53  | 43  | 33 | -  | -  |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 67   | 92  | 10.7             | 91   | 84  | 74  | 64  | 54 | 44 | 34   |   |                  |                  |  |     |     |    |    |    |  |  |
| 4000              | 62   | 81  | 10.2             | 81   | 81  | 77  | 67  | 57 | 47 | 37   |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 57   | 84  | 10.6             | 84   | 84  | 80  | 70  | 60 | 50 | 40   |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 72   | 104                                       | 11.1             | 80   | 69  | 57  | 46  | 34 | -  | -  |   |                  |                  |  |     |     |    |    |    |  |  |
| 4500              | 67   | 95  | 10.8             | 95   | 92  | 80  | 68  | 57 | 45 | 33   |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 62   | 83  | 10.3             | 83   | 83  | 83  | 72  | 61 | 49 | 37   |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 57   | 87  | 10.7             | 87   | 87  | 87  | 75  | 63 | 52 | 40   |   |                  |                  |  |     |     |    |    |    |  |  |
| 5000              | 72   | 101                                       | 11.1             | 89   | 76  | 62  | 49  | 36 | -  | -  |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 67   | 93  | 10.9             | 93   | 93  | 87  | 74  | 61 | 47 | 34   |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 62   | 82  | 10.4             | 82   | 82  | 82  | 69  | 55 | 42 | 29   |   |                  |                  |  |     |     |    |    |    |  |  |
| 3000              | 57   | 85  | 10.8             | 85   | 85  | 85  | 72  | 59 | 45 | 32   |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 72   | 99  | 11.2             | 97   | 82  | 67  | 52  | 38 | -  | -  |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 67   | 91  | 10.9             | 91   | 91  | 91  | 79  | 65 | 50 | 35   |   |                  |                  |  |     |     |    |    |    |  |  |
| 3500              | 62   | 80  | 10.4             | 80   | 80  | 80  | 65  | 50 | 35 | 20   |   |                  |                  |  |     |     |    |    |    |  |  |
|                   | 57   | 83  | 10.8             | 83   | 83  | 83  | 68  | 54 | 39 | 24   |   |                  |                  |  |     |     |    |    |    |  |  |

\* These capacities are gross ratings. For net capacity, deduct air blower motor, MBH = 3.415 x kW. Refer to the appropriate Blower Performance Table for the kW of the supply air blower motor.

† These ratings include condenser fan motors and the compressor motors but not the supply air blower motor.

**TABLE 9: COOLING CAPACITY DH150 (12-1/2 TON) UNIT**

| Air On Evap. Coil                          |         | Temperature of Air on Condenser Coil 85°F |                  |  |     |     |     |     |     |     | Temperature of Air on Condenser Coil 95°F |                  |                  |  |     |     |     |     |    |   |  |
|--|---------|---|------------------|--|-----|-----|-----|-----|-----|-----|---|------------------|------------------|--|-----|-----|-----|-----|----|---|--|
| CFM  | WB (°F) | Tot. Cap.* (MBH)                          | Tot. Input† (kW) | Sensible Capacity (MBH)*<br>Return Dry Bulb (°F) |     |     |     |     |     |     |   | Tot. Cap.* (MBH) | Tot. Input† (kW) | Sensible Capacity (MBH)*<br>Return Dry Bulb (°F) |     |     |     |     |    |   |  |
|  |         |   |                  | 86   | 83  | 80  | 77  | 74  | 71  | 68  | 86  |                  |                  | 83   | 80  | 77  | 74  | 71  | 68 |   |  |
| 3750                                       | 72      | 165                                       | 11.9             | 95   | 85  | 74  | 63  | 52  | -   | -   | 159                                       | 13.1             | 94               | 83   | 72  | 62  | 51  | -   | -  |   |  |
|  | 67      | 158                                       | 11.8             | 124  | 114 | 103 | 92  | 82  | 71  | 60  | 151                                       | 13.0             | 121              | 111  | 100 | 89  | 79  | 68  | 57 |   |  |
|  | 62      | 148                                       | 11.6             | 147  | 137 | 126 | 115 | 105 | 94  | 83  | 141                                       | 12.8             | 141              | 135  | 124 | 113 | 103 | 92  | 81 |   |  |
| 4375                                       | 57      | 138                                       | 11.5             | 138  | 135 | 124 | 113 | 103 | 92  | 81  | 132                                       | 12.8             | 132              | 130  | 120 | 109 | 98  | 87  | 77 |   |  |
|  | 72      | 169                                       | 11.9             | 105  | 92  | 80  | 67  | 54  | -   | -   | 163                                       | 13.2             | 103              | 91   | 78  | 65  | 53  | -   | -  |   |  |
|  | 67      | 161                                       | 11.8             | 136  | 124 | 111 | 98  | 86  | 73  | 61  | 155                                       | 13.1             | 133              | 121  | 108 | 95  | 83  | 70  | 57 |   |  |
| 5000                                       | 62      | 151                                       | 11.7             | 151  | 146 | 136 | 123 | 111 | 98  | 85  | 144                                       | 12.9             | 144              | 141  | 134 | 121 | 109 | 96  | 83 |   |  |
|  | 57      | 141                                       | 11.5             | 141  | 139 | 134 | 121 | 109 | 96  | 83  | 135                                       | 12.8             | 135              | 134  | 129 | 116 | 104 | 91  | 78 |   |  |
|  | 72      | 172                                       | 12.0             | 115  | 100 | 86  | 71  | 56  | -   | -   | 167                                       | 13.2             | 113              | 98   | 84  | 69  | 55  | -   | -  |   |  |
| 5625                                       | 67      | 165                                       | 11.9             | 148  | 134 | 119 | 105 | 90  | 76  | 61  | 159                                       | 13.1             | 145              | 131  | 116 | 101 | 87  | 72  | 58 |   |  |
|  | 62      | 155                                       | 11.7             | 155  | 155 | 146 | 132 | 117 | 102 | 88  | 148                                       | 12.9             | 148              | 148  | 144 | 129 | 115 | 100 | 85 |   |  |
|  | 57      | 144                                       | 11.6             | 144  | 144 | 144 | 129 | 115 | 100 | 86  | 139                                       | 12.9             | 139              | 139  | 139 | 124 | 109 | 95  | 80 |   |  |
| 6250                                       | 72      | 172                                       | 11.9             | 121  | 105 | 88  | 71  | 55  | -   | -   | 166                                       | 13.2             | 120              | 104  | 87  | 70  | 54  | -   | -  |   |  |
|  | 67      | 164                                       | 11.8             | 156  | 139 | 122 | 106 | 89  | 73  | 56  | 158                                       | 13.1             | 151              | 137  | 120 | 104 | 87  | 71  | 54 |   |  |
|  | 62      | 154                                       | 11.7             | 154  | 154 | 150 | 133 | 117 | 100 | 83  | 147                                       | 12.9             | 147              | 147  | 145 | 128 | 112 | 95  | 78 |   |  |
| 6250                                       | 57      | 143                                       | 11.5             | 143  | 143 | 143 | 127 | 110 | 94  | 77  | 138                                       | 12.8             | 138              | 138  | 138 | 121 | 104 | 88  | 71 |   |  |
|  | 72      | 171                                       | 11.9             | 127  | 109 | 90  | 72  | 53  | -   | -   | 165                                       | 13.2             | 127              | 109  | 90  | 71  | 53  | -   | -  |   |  |
|  | 67      | 164                                       | 11.8             | 163  | 144 | 126 | 107 | 88  | 70  | 51  | 157                                       | 13.1             | 157              | 143  | 125 | 106 | 88  | 69  | 50 |   |  |
| 62   | 154     | 11.6                                      | 154              | 154  | 154 | 135 | 116 | 98  | 79  | 146 | 12.9                                      | 146              | 146              | 146  | 127 | 108 | 90  | 71  |    |   |  |
| 57   | 143     | 11.5                                      | 143              | 143  | 143 | 124 | 106 | 87  | 68  | 137 | 12.8                                      | 137              | 137              | 137  | 118 | 99  | 81  | 62  |    |   |  |
| Temperature of Air on Condenser Coil 105°F |         |   |                  |  |     |     |     |     |     |     |   |                  |                  |  |     |     |     |     |    |   |  |
| 3750                                       | 72      | 152                                       | 14.6             | 91   | 80  | 70  | 59  | 48  | -   | -   | 145                                       | 16.2             | 88               | 78   | 67  | 56  | 46  | -   | -  |   |  |
|  | 67      | 143                                       | 14.5             | 118  | 107 | 97  | 86  | 75  | 64  | 54  | 135                                       | 15.9             | 114              | 104  | 93  | 82  | 72  | 61  | 50 |   |  |
|  | 62      | 133                                       | 14.3             | 133  | 128 | 118 | 107 | 96  | 86  | 75  | 125                                       | 15.8             | 125              | 122  | 111 | 101 | 90  | 79  | 68 |   |  |
| 4375                                       | 57      | 124                                       | 14.2             | 124  | 122 | 111 | 100 | 90  | 79  | 68  | 116                                       | 15.7             | 116              | 113  | 103 | 92  | 81  | 71  | 60 |   |  |
|  | 72      | 156                                       | 14.7             | 101  | 88  | 76  | 63  | 50  | -   | -   | 149                                       | 16.2             | 99               | 86   | 73  | 61  | 48  | -   | -  |   |  |
|  | 67      | 147                                       | 14.5             | 130  | 118 | 105 | 92  | 80  | 67  | 54  | 138                                       | 15.9             | 127              | 114  | 102 | 89  | 77  | 64  | 51 |   |  |
| 5000                                       | 62      | 137                                       | 14.3             | 137  | 134 | 128 | 115 | 103 | 90  | 77  | 129                                       | 15.8             | 129              | 127  | 122 | 109 | 96  | 84  | 71 |   |  |
|  | 57      | 127                                       | 14.3             | 127  | 126 | 121 | 108 | 95  | 83  | 70  | 119                                       | 15.7             | 119              | 118  | 112 | 100 | 87  | 75  | 62 |   |  |
|  | 72      | 160                                       | 14.7             | 111  | 96  | 82  | 67  | 53  | -   | -   | 153                                       | 16.2             | 109              | 94   | 80  | 65  | 50  | -   | -  |   |  |
| 5625                                       | 67      | 150                                       | 14.5             | 142  | 128 | 113 | 99  | 84  | 70  | 55  | 142                                       | 15.9             | 140              | 125  | 111 | 96  | 81  | 67  | 52 |   |  |
|  | 62      | 140                                       | 14.4             | 140  | 140 | 138 | 123 | 109 | 94  | 80  | 132                                       | 15.8             | 132              | 132  | 132 | 118 | 103 | 88  | 74 |   |  |
|  | 57      | 130                                       | 14.3             | 130  | 130 | 130 | 116 | 101 | 87  | 72  | 122                                       | 15.8             | 122              | 122  | 122 | 108 | 93  | 78  | 64 |   |  |
| 6250                                       | 72      | 159                                       | 14.7             | 118  | 102 | 85  | 68  | 52  | -   | -   | 152                                       | 16.2             | 116              | 100  | 83  | 66  | 50  | -   | -  |   |  |
|  | 67      | 149                                       | 14.5             | 145  | 134 | 118 | 101 | 85  | 68  | 51  | 141                                       | 15.9             | 140              | 132  | 115 | 99  | 82  | 66  | 49 |   |  |
|  | 62      | 139                                       | 14.4             | 139  | 139 | 138 | 121 | 105 | 88  | 72  | 131                                       | 15.8             | 131              | 131  | 131 | 115 | 98  | 81  | 65 |   |  |
| 6250                                       | 57      | 129                                       | 14.3             | 129  | 129 | 129 | 113 | 96  | 80  | 63  | 121                                       | 15.8             | 121              | 121  | 121 | 105 | 88  | 71  | 55 |   |  |
|  | 72      | 158                                       | 14.7             | 126  | 107 | 88  | 70  | 51  | -   | -   | 151                                       | 16.2             | 124              | 105  | 87  | 68  | 49  | -   | -  |   |  |
|  | 67      | 148                                       | 14.5             | 148  | 141 | 122 | 104 | 85  | 67  | 48  | 140                                       | 15.9             | 140              | 139  | 120 | 102 | 83  | 64  | 46 |   |  |
| 62   | 138     | 14.3                                      | 138              | 138  | 138 | 119 | 101 | 82  | 63  | 130 | 15.8                                      | 130              | 130              | 130  | 112 | 93  | 74  | 56  |    |   |  |
| 57   | 128     | 14.3                                      | 128              | 128  | 128 | 110 | 91  | 72  | 54  | 120 | 15.8                                      | 120              | 120              | 120  | 102 | 83  | 64  | 46  |    |   |  |
| Temperature of Air on Condenser Coil 125°F |         |   |                  |  |     |     |     |     |     |     |   |                  |                  |  |     |     |     |     |    |   |  |
| 3750                                       | 72      | 138                                       | 17.7             | 86   | 75  | 64  | 54  | 43  | -   | -   | -   | -                | -                | -  | -   | -   | -   | -   | -  |   |  |
|  | 67      | 126                                       | 17.3             | 111  | 100 | 90  | 79  | 68  | 58  | 47  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 62      | 118                                       | 17.2             | 118  | 116 | 105 | 94  | 83  | 73  | 62  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
| 4375                                       | 57      | 108                                       | 17.2             | 108  | 105 | 94  | 84  | 73  | 62  | 52  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 72      | 142                                       | 17.7             | 96   | 84  | 71  | 58  | 46  | -   | -   | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 67      | 130                                       | 17.3             | 124  | 111 | 99  | 86  | 73  | 61  | 48  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
| 5000                                       | 62      | 121                                       | 17.2             | 121  | 120 | 116 | 103 | 90  | 78  | 65  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 57      | 111                                       | 17.2             | 111  | 109 | 104 | 91  | 79  | 66  | 54  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 72      | 146                                       | 17.7             | 107  | 92  | 78  | 63  | 48  | -   | -   | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
| 5625                                       | 67      | 133                                       | 17.4             | 133  | 122 | 108 | 93  | 79  | 64  | 50  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 62      | 124                                       | 17.2             | 124  | 124 | 124 | 112 | 97  | 83  | 68  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 57      | 114                                       | 17.2             | 114  | 114 | 114 | 99  | 85  | 70  | 56  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
| 6250                                       | 72      | 145                                       | 17.7             | 114  | 98  | 81  | 65  | 48  | -   | -   | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 67      | 132                                       | 17.4             | 132  | 130 | 113 | 96  | 80  | 63  | 46  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 62      | 123                                       | 17.3             | 123  | 123 | 123 | 108 | 91  | 75  | 58  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
| 6250                                       | 57      | 113                                       | 17.2             | 113  | 113 | 113 | 96  | 80  | 63  | 47  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 72      | 144                                       | 17.7             | 122  | 103 | 85  | 66  | 47  | -   | -   | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
|  | 67      | 131                                       | 17.4             | 131  | 131 | 118 | 99  | 81  | 62  | 43  | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
| 62   | 122     | 17.3                                      | 122              | 122  | 122 | 104 | 85  | 67  | 48  | -   | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |
| 57   | 112     | 17.2                                      | 112              | 112  | 112 | 93  | 75  | 56  | 38  | -   | -   | -                | -                | -  | -   | -   | -   | -   | -  | - |  |

\* These capacities are gross ratings. For net capacity, deduct air blower motor, MBH = 3.415 x kW. Refer to the appropriate Blower Performance Table for the kW of the supply air blower motor.

† These ratings include condenser fan motors and the compressor motors but not the supply air blower motor.

**TABLE 10: ELECTRICAL DATA DH078 (6-1/2 TON) HIGH EFFICIENCY W/O PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |      | OD Fan Motors | Supply Blower Motor FLA |     | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |     | Max Fuse Size w/Power Exhaust (Amps) |     |
|---------|-------------|------|---------------|-------------------------|-----|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|-----|--------------------------------------|-----|
|         | RLA         | LRA  | FLA           | 1.5                     | 2   | FLA           | FLA             |                           |           |             | 1.5                          | 2     | 1.5                        | 2     | 1.5                   | 2   | 1.5                                  | 2   |
|         | ea.         | ea.  | ea.           | HP                      | HP  |               |                 |                           |           |             | HP                           | HP    | HP                         | HP    | HP                    | HP  | HP                                   | HP  |
| 208     | 9.0         | 72.0 | 1.5           | 6.2                     | 8.2 | 5.5           | 0.0             | None                      | --        | --          | 29.5                         | 31.5  | 35.0                       | 37.0  | 35                    | 40  | 40                                   | 45  |
|         |             |      |               |                         |     |               |                 | 2TP04540925               | 6.8       | 18.9        | 31.3                         | 33.8  | 38.2                       | 40.7  | 35                    | 40  | 40                                   | 45  |
|         |             |      |               |                         |     |               |                 | 2TP04541825               | 13.5      | 37.5        | 54.6                         | 57.1  | 61.5                       | 64.0  | 60                    | 60  | 70                                   | 70  |
|         |             |      |               |                         |     |               |                 | 2TP04542425               | 18        | 50.0        | 70.2                         | 72.7  | 77.1                       | 79.6  | 80                    | 80  | 80                                   | 80  |
|         |             |      |               |                         |     |               |                 | 2TP04543625               | 25.5      | 70.8        | 96.2                         | 98.7  | 103.1                      | 105.6 | 100                   | 100 | 110                                  | 110 |
| 230     | 9.0         | 72.0 | 1.5           | 6.2                     | 8.2 | 5.5           | 0.0             | None                      | --        | --          | 29.5                         | 31.5  | 35.0                       | 37.0  | 35                    | 40  | 40                                   | 45  |
|         |             |      |               |                         |     |               |                 | 2TP04540925               | 9         | 21.7        | 34.8                         | 37.3  | 41.7                       | 44.2  | 35                    | 40  | 45                                   | 45  |
|         |             |      |               |                         |     |               |                 | 2TP04541825               | 18        | 43.3        | 61.9                         | 64.4  | 68.8                       | 71.3  | 70                    | 70  | 70                                   | 80  |
|         |             |      |               |                         |     |               |                 | 2TP04542425               | 24        | 57.7        | 79.9                         | 82.4  | 86.8                       | 89.3  | 80                    | 90  | 90                                   | 90  |
|         |             |      |               |                         |     |               |                 | 2TP04543625               | 34        | 81.8        | 110.0                        | 112.5 | 116.9                      | 119.4 | 110                   | 125 | 125                                  | 125 |
| 460     | 5.8         | 45.0 | 0.8           | 3.1                     | 4.1 | 2.2           | 0.0             | None                      | --        | --          | 17.8                         | 18.8  | 20                         | 21    | 20                    | 20  | 25                                   | 25  |
|         |             |      |               |                         |     |               |                 | 2TP04540946               | 9         | 11.3        | 17.8                         | 18.8  | 20.2                       | 21.4  | 20                    | 20  | 25                                   | 25  |
|         |             |      |               |                         |     |               |                 | 2TP04541846               | 18        | 22.6        | 30.9                         | 32.2  | 33.7                       | 34.9  | 35                    | 35  | 35                                   | 35  |
|         |             |      |               |                         |     |               |                 | 2TP04542446               | 24        | 30.1        | 40                           | 41.2  | 42.7                       | 44    | 40                    | 45  | 45                                   | 45  |
|         |             |      |               |                         |     |               |                 | 2TP04543646               | 34        | 42.7        | 55                           | 56.2  | 57.7                       | 59    | 60                    | 60  | 60                                   | 60  |
| 575     | 4.5         | 36.0 | 0.6           | 2.4                     | 3.6 | 1.8           | 0.0             | None                      | --        | --          | 13.7                         | 14.9  | 15.5                       | 16.7  | 15                    | 15  | 20                                   | 20  |
|         |             |      |               |                         |     |               |                 | 2TP04540958               | 9         | 9.0         | 13.8                         | 15.3  | 16.1                       | 17.6  | 15                    | 20  | 20                                   | 20  |
|         |             |      |               |                         |     |               |                 | 2TP04541858               | 18        | 18.1        | 24.7                         | 26.2  | 26.9                       | 28.4  | 25                    | 30  | 30                                   | 30  |
|         |             |      |               |                         |     |               |                 | 2TP04542458               | 24        | 24.1        | 31.9                         | 33.4  | 34.1                       | 35.6  | 35                    | 35  | 35                                   | 40  |
|         |             |      |               |                         |     |               |                 | 2TP04543658               | 34        | 34.1        | 43.9                         | 45.4  | 46.1                       | 47.6  | 45                    | 50  | 50                                   | 50  |

**TABLE 11: ELECTRICAL DATA DH078 (6-1/2 TON) HIGH EFFICIENCY WITH PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |      | OD Fan Motors | Supply Blower Motor FLA |     | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |     | Max Fuse Size w/Power Exhaust (Amps) |     |
|---------|-------------|------|---------------|-------------------------|-----|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|-----|--------------------------------------|-----|
|         | RLA         | LRA  | FLA           | 1.5                     | 2   | FLA           | FLA             |                           |           |             | 1.5                          | 2     | 1.5                        | 2     | 1.5                   | 2   | 1.5                                  | 2   |
|         | ea.         | ea.  | ea.           | HP                      | HP  |               |                 |                           |           |             | HP                           | HP    | HP                         | HP    | HP                    | HP  | HP                                   | HP  |
| 208     | 9.0         | 72.0 | 1.5           | 6.2                     | 8.2 | 5.5           | 10.0            | None                      | --        | --          | 39.7                         | 41.7  | 45.2                       | 47.2  | 45                    | 50  | 50                                   | 50  |
|         |             |      |               |                         |     |               |                 | 2TP04540925               | 6.8       | 18.9        | 43.8                         | 46.3  | 50.7                       | 53.2  | 45                    | 50  | 60                                   | 60  |
|         |             |      |               |                         |     |               |                 | 2TP04541825               | 13.5      | 37.5        | 67.1                         | 69.6  | 74.0                       | 76.5  | 70                    | 70  | 80                                   | 80  |
|         |             |      |               |                         |     |               |                 | 2TP04542425               | 18        | 50.0        | 82.7                         | 85.2  | 89.6                       | 92.1  | 90                    | 90  | 90                                   | 100 |
|         |             |      |               |                         |     |               |                 | 2TP04543625               | 25.5      | 70.8        | 108.7                        | 111.2 | 115.6                      | 118.1 | 110                   | 125 | 125                                  | 125 |
| 230     | 9.0         | 72.0 | 1.5           | 6.2                     | 8.2 | 5.5           | 10.0            | None                      | --        | --          | 39.7                         | 41.7  | 45.2                       | 47.2  | 45                    | 50  | 50                                   | 50  |
|         |             |      |               |                         |     |               |                 | 2TP04540925               | 9         | 21.7        | 47.3                         | 49.8  | 54.2                       | 56.7  | 50                    | 50  | 60                                   | 60  |
|         |             |      |               |                         |     |               |                 | 2TP04541825               | 18        | 43.3        | 74.4                         | 76.9  | 81.3                       | 83.8  | 80                    | 80  | 90                                   | 90  |
|         |             |      |               |                         |     |               |                 | 2TP04542425               | 24        | 57.7        | 92.4                         | 94.9  | 99.3                       | 101.8 | 100                   | 100 | 100                                  | 110 |
|         |             |      |               |                         |     |               |                 | 2TP04543625               | 34        | 81.8        | 122.5                        | 125.0 | 129.4                      | 131.9 | 125                   | 125 | 150                                  | 150 |
| 460     | 5.8         | 45.0 | 0.8           | 3.1                     | 4.1 | 2.2           | 5.0             | None                      | --        | --          | 22.8                         | 23.8  | 25                         | 26    | 25                    | 25  | 30                                   | 30  |
|         |             |      |               |                         |     |               |                 | 2TP04540946               | 9         | 11.3        | 23.7                         | 24.9  | 26.4                       | 27.7  | 25                    | 25  | 30                                   | 30  |
|         |             |      |               |                         |     |               |                 | 2TP04541846               | 18        | 22.6        | 37.2                         | 38.4  | 39.9                       | 41.2  | 40                    | 40  | 40                                   | 45  |
|         |             |      |               |                         |     |               |                 | 2TP04542446               | 24        | 30.1        | 46.2                         | 47.5  | 49                         | 50.2  | 50                    | 50  | 50                                   | 60  |
|         |             |      |               |                         |     |               |                 | 2TP04543646               | 34        | 42.7        | 61.2                         | 62.5  | 64                         | 65.2  | 70                    | 70  | 70                                   | 70  |
| 575     | 4.5         | 36.0 | 0.6           | 2.4                     | 3.6 | 1.8           | 4.0             | None                      | --        | --          | 17.7                         | 18.9  | 19.5                       | 20.7  | 20                    | 20  | 20                                   | 25  |
|         |             |      |               |                         |     |               |                 | 2TP04540958               | 9         | 9.0         | 18.8                         | 20.3  | 21.1                       | 22.6  | 20                    | 25  | 25                                   | 25  |
|         |             |      |               |                         |     |               |                 | 2TP04541858               | 18        | 18.1        | 29.7                         | 31.2  | 31.9                       | 33.4  | 30                    | 35  | 35                                   | 35  |
|         |             |      |               |                         |     |               |                 | 2TP04542458               | 24        | 24.1        | 36.9                         | 38.4  | 39.1                       | 40.6  | 40                    | 40  | 40                                   | 45  |
|         |             |      |               |                         |     |               |                 | 2TP04543658               | 34        | 34.1        | 48.9                         | 50.4  | 51.1                       | 52.6  | 50                    | 60  | 60                                   | 60  |

**TABLE 12: ELECTRICAL DATA DH090 (7-1/2 TON) HIGH EFFICIENCY W/O PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |      | OD Fan Motors | Supply Blower Motor FLA |      | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |      | Max Fuse Size w/Power Exhaust (Amps) |      |      |      |
|---------|-------------|------|---------------|-------------------------|------|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|------|--------------------------------------|------|------|------|
|         | RLA         | LRA  | FLA           | 2 HP                    | 3 HP | FLA           | FLA             |                           |           |             | 2 HP                         | 3 HP  | 2HP                        | 3 HP  | 2 HP                  | 3 HP | 2 HP                                 | 3 HP | 2 HP | 3 HP |
|         | ea.         | ea.  | ea.           |                         |      |               |                 |                           |           |             |                              |       |                            |       |                       |      |                                      |      |      |      |
| 208     | 11.5        | 84.0 | 1.5           | 8.2                     | 10.9 | 5.5           | 0.0             | None                      | -         | -           | 37.1                         | 39.8  | 42.6                       | 45.3  | 45                    | 50   | 50                                   | 50   |      |      |
|         |             |      |               |                         |      |               |                 | 2TP04540925               | 6.8       | 18.9        | 37.1                         | 39.8  | 42.6                       | 45.3  | 45                    | 50   | 50                                   | 50   | 50   | 50   |
|         |             |      |               |                         |      |               |                 | 2TP04541825               | 13.5      | 37.5        | 57.1                         | 60.5  | 64.0                       | 67.3  | 60                    | 70   | 70                                   | 70   | 70   | 70   |
|         |             |      |               |                         |      |               |                 | 2TP04542425               | 18.0      | 50.0        | 72.7                         | 76.1  | 79.6                       | 83.0  | 80                    | 80   | 80                                   | 80   | 80   | 90   |
|         |             |      |               |                         |      |               |                 | 2TP04543625               | 25.5      | 70.8        | 98.7                         | 102.1 | 105.6                      | 109.0 | 100                   | 110  | 110                                  | 110  | 110  | 110  |
| 230     | 11.5        | 84.0 | 1.5           | 8.2                     | 10.9 | 5.5           | 0.0             | None                      | -         | -           | 37.1                         | 39.8  | 42.6                       | 45.3  | 45                    | 50   | 50                                   | 50   |      |      |
|         |             |      |               |                         |      |               |                 | 2TP04540925               | 9.0       | 21.7        | 37.3                         | 40.7  | 44.2                       | 47.6  | 45                    | 50   | 50                                   | 50   | 50   |      |
|         |             |      |               |                         |      |               |                 | 2TP04541825               | 18.0      | 43.3        | 64.4                         | 67.8  | 71.3                       | 74.6  | 70                    | 70   | 80                                   | 80   | 80   |      |
|         |             |      |               |                         |      |               |                 | 2TP04542425               | 24.0      | 57.7        | 82.4                         | 85.8  | 89.3                       | 92.7  | 90                    | 90   | 90                                   | 90   | 100  |      |
|         |             |      |               |                         |      |               |                 | 2TP04543625               | 34.0      | 81.8        | 112.5                        | 115.9 | 119.4                      | 122.7 | 125                   | 125  | 125                                  | 125  | 125  |      |
| 460     | 7.1         | 54.0 | 0.8           | 4.1                     | 5.3  | 2.2           | 0.0             | None                      | -         | -           | 21.7                         | 22.9  | 23.9                       | 25.1  | 25                    | 25   | 30                                   | 30   |      |      |
|         |             |      |               |                         |      |               |                 | 2TP04540946               | 9.0       | 11.3        | 21.7                         | 22.9  | 23.9                       | 25.1  | 25                    | 25   | 30                                   | 30   | 30   |      |
|         |             |      |               |                         |      |               |                 | 2TP04541846               | 18.0      | 22.6        | 32.2                         | 33.7  | 34.9                       | 36.4  | 35                    | 35   | 35                                   | 40   | 40   |      |
|         |             |      |               |                         |      |               |                 | 2TP04542446               | 24.0      | 30.1        | 41.2                         | 42.7  | 44.0                       | 45.5  | 45                    | 45   | 45                                   | 50   | 50   |      |
|         |             |      |               |                         |      |               |                 | 2TP04543646               | 34.0      | 42.7        | 56.2                         | 57.7  | 59.0                       | 60.5  | 60                    | 60   | 60                                   | 70   | 70   |      |
| 575     | 5.1         | 34.0 | 0.6           | 3.6                     | 4.1  | 1.8           | 0.0             | None                      | -         | -           | 16.3                         | 16.8  | 18.1                       | 18.8  | 20                    | 20   | 20                                   | 20   |      |      |
|         |             |      |               |                         |      |               |                 | 2TP04540946               | 9.0       | 9.0         | 16.3                         | 16.8  | 18.1                       | 18.8  | 20                    | 20   | 20                                   | 20   | 20   |      |
|         |             |      |               |                         |      |               |                 | 2TP04541846               | 18.0      | 18.1        | 26.2                         | 26.8  | 28.4                       | 29.0  | 30                    | 30   | 30                                   | 30   | 30   |      |
|         |             |      |               |                         |      |               |                 | 2TP04542446               | 24.0      | 24.1        | 33.4                         | 34.0  | 35.6                       | 36.2  | 35                    | 35   | 40                                   | 40   | 40   |      |
|         |             |      |               |                         |      |               |                 | 2TP04543646               | 34.0      | 34.1        | 45.4                         | 46.0  | 47.6                       | 48.3  | 50                    | 50   | 50                                   | 50   | 50   |      |

**TABLE 13: ELECTRICAL DATA DH090 (7-1/2 TON) HIGH EFFICIENCY WITH PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |      | OD Fan Motors | Supply Blower Motor FLA |      | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |      | Max Fuse Size w/Power Exhaust (Amps) |      |      |      |
|---------|-------------|------|---------------|-------------------------|------|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|------|--------------------------------------|------|------|------|
|         | RLA         | LRA  | FLA           | 2 HP                    | 3 HP | FLA           | FLA             |                           |           |             | 2 HP                         | 3 HP  | 2HP                        | 3 HP  | 2 HP                  | 3 HP | 2 HP                                 | 3 HP | 2 HP | 3 HP |
|         | ea.         | ea.  | ea.           |                         |      |               |                 |                           |           |             |                              |       |                            |       |                       |      |                                      |      |      |      |
| 208     | 11.5        | 84.0 | 1.5           | 8.2                     | 10.9 | 5.5           | 10.0            | None                      | -         | -           | 47.1                         | 49.8  | 52.6                       | 55.3  | 50                    | 60   | 60                                   | 60   |      |      |
|         |             |      |               |                         |      |               |                 | 2TP04540925               | 6.8       | 18.9        | 47.1                         | 49.8  | 53.2                       | 56.6  | 50                    | 60   | 60                                   | 60   | 60   |      |
|         |             |      |               |                         |      |               |                 | 2TP04541825               | 13.5      | 37.5        | 69.6                         | 73.0  | 76.5                       | 79.8  | 70                    | 80   | 80                                   | 80   | 80   |      |
|         |             |      |               |                         |      |               |                 | 2TP04542425               | 18.0      | 50.0        | 85.2                         | 88.6  | 92.1                       | 95.5  | 90                    | 90   | 100                                  | 100  | 100  |      |
|         |             |      |               |                         |      |               |                 | 2TP04543625               | 25.5      | 70.8        | 111.2                        | 114.6 | 118.1                      | 121.5 | 125                   | 125  | 125                                  | 125  | 125  |      |
| 230     | 11.5        | 84.0 | 1.5           | 8.2                     | 10.9 | 5.5           | 10.0            | None                      | -         | -           | 47.1                         | 49.8  | 52.6                       | 55.3  | 50                    | 60   | 60                                   | 60   |      |      |
|         |             |      |               |                         |      |               |                 | 2TP04540925               | 9.0       | 21.7        | 49.8                         | 53.2  | 56.7                       | 60.1  | 50                    | 60   | 60                                   | 70   | 70   |      |
|         |             |      |               |                         |      |               |                 | 2TP04541825               | 18.0      | 43.3        | 76.9                         | 80.3  | 83.8                       | 87.1  | 80                    | 90   | 90                                   | 90   | 90   |      |
|         |             |      |               |                         |      |               |                 | 2TP04542425               | 24.0      | 57.7        | 94.9                         | 98.3  | 101.8                      | 105.2 | 100                   | 100  | 110                                  | 110  | 110  |      |
|         |             |      |               |                         |      |               |                 | 2TP04543625               | 34.0      | 81.8        | 125                          | 128.4 | 131.9                      | 135.2 | 125                   | 150  | 150                                  | 150  | 150  |      |
| 460     | 7.1         | 54.0 | 0.8           | 4.1                     | 5.3  | 2.2           | 5.0             | None                      | -         | -           | 26.7                         | 27.9  | 28.9                       | 30.1  | 30                    | 30   | 35                                   | 35   |      |      |
|         |             |      |               |                         |      |               |                 | 2TP04540946               | 9.0       | 11.3        | 26.7                         | 27.9  | 28.9                       | 30.1  | 30                    | 30   | 35                                   | 35   | 35   |      |
|         |             |      |               |                         |      |               |                 | 2TP04541846               | 18.0      | 22.6        | 38.4                         | 39.9  | 41.2                       | 42.7  | 40                    | 40   | 45                                   | 45   | 45   |      |
|         |             |      |               |                         |      |               |                 | 2TP04542446               | 24.0      | 30.1        | 47.5                         | 49.0  | 50.2                       | 51.7  | 50                    | 50   | 50                                   | 60   | 60   |      |
|         |             |      |               |                         |      |               |                 | 2TP04543646               | 34.0      | 42.7        | 62.5                         | 64.0  | 65.2                       | 66.7  | 70                    | 70   | 70                                   | 70   | 70   |      |
| 575     | 5.1         | 34.0 | 0.6           | 3.6                     | 4.1  | 1.8           | 4.0             | None                      | -         | -           | 20.3                         | 20.8  | 22.1                       | 22.6  | 25                    | 25   | 25                                   | 25   |      |      |
|         |             |      |               |                         |      |               |                 | 2TP04540946               | 9.0       | 9.0         | 20.3                         | 21.0  | 22.6                       | 23.2  | 25                    | 25   | 25                                   | 25   | 25   |      |
|         |             |      |               |                         |      |               |                 | 2TP04541846               | 18.0      | 18.1        | 31.2                         | 31.8  | 33.4                       | 34.0  | 35                    | 35   | 35                                   | 35   | 35   |      |
|         |             |      |               |                         |      |               |                 | 2TP04542446               | 24.0      | 24.1        | 38.4                         | 39.0  | 40.6                       | 41.2  | 40                    | 40   | 45                                   | 45   | 45   |      |
|         |             |      |               |                         |      |               |                 | 2TP04543646               | 34.0      | 34.1        | 50.4                         | 51.0  | 52.6                       | 53.3  | 60                    | 60   | 60                                   | 60   | 60   |      |

**TABLE 14: ELECTRICAL DATA DH102 (8-1/2 TON) HIGH EFFICIENCY W/O PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |         | OD Fan Motors | Supply Blower Motor FLA |      | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |      | Max Fuse Size w/Power Exhaust (Amps) |      |      |      |
|---------|-------------|---------|---------------|-------------------------|------|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|------|--------------------------------------|------|------|------|
|         | RLA ea.     | LRA ea. | FLA ea.       | 3 HP                    | 3 HP | FLA           | FLA             |                           |           |             | 3 HP                         | 3 HP  | 3 HP                       | 3 HP  | 3 HP                  | 3 HP | 3 HP                                 | 3 HP | 3 HP | 3 HP |
|         | 208         | 11.7    | 88.0          | 3.5                     | 10.9 | 10.9          | 5.5             |                           |           |             | 0.0                          | None  | --                         | --    | 44.2                  | 44.2 | 49.7                                 | 49.7 | 50   | 50   |
|         |             |         |               |                         |      |               |                 | 2TP04540925               | 6.8       | 18.9        | 44.2                         | 44.2  | 49.7                       | 49.7  | 50                    | 50   | 60                                   | 60   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04541825               | 13.5      | 37.5        | 60.5                         | 60.5  | 67.3                       | 67.3  | 70                    | 70   | 70                                   | 70   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04542425               | 18        | 50.0        | 76.1                         | 76.1  | 83.0                       | 83.0  | 80                    | 80   | 90                                   | 90   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04543625               | 25.5      | 70.8        | 102.1                        | 102.1 | 109.0                      | 109.0 | 110                   | 110  | 110                                  | 110  |      |      |
| 230     | 11.7        | 88.0    | 3.5           | 10.9                    | 10.9 | 5.5           | 0.0             | None                      | --        | --          | 44.2                         | 44.2  | 50.4                       | 50.4  | 50                    | 50   | 60                                   | 60   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04540925               | 9         | 21.7        | 44.2                         | 44.2  | 50.4                       | 50.4  | 50                    | 50   | 60                                   | 60   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04541825               | 18        | 43.3        | 67.8                         | 67.8  | 74.6                       | 74.6  | 70                    | 70   | 80                                   | 80   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04542425               | 24        | 57.7        | 85.8                         | 85.8  | 92.7                       | 92.7  | 90                    | 90   | 100                                  | 100  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04543625               | 34        | 81.8        | 115.9                        | 115.9 | 122.7                      | 122.7 | 125                   | 125  | 125                                  | 125  |      |      |
| 460     | 6.4         | 42.0    | 1.6           | 5.3                     | 5.3  | 2.2           | 0.0             | None                      | --        | --          | 22.9                         | 22.9  | 25.1                       | 25.1  | 25                    | 25   | 30                                   | 30   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04540946               | 9         | 11.3        | 22.9                         | 22.9  | 25.1                       | 25.1  | 25                    | 25   | 30                                   | 30   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04541846               | 18        | 22.6        | 33.7                         | 33.7  | 36.4                       | 36.4  | 35                    | 35   | 40                                   | 40   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04542446               | 24        | 30.1        | 42.7                         | 42.7  | 45.5                       | 45.5  | 45                    | 45   | 50                                   | 50   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04543646               | 34        | 42.7        | 57.7                         | 57.7  | 60.5                       | 60.5  | 60                    | 60   | 70                                   | 70   |      |      |
| 575     | 5.1         | 36.0    | 1.3           | 4.1                     | 4.1  | 1.8           | 0.0             | None                      | --        | --          | 18.2                         | 18.2  | 20                         | 20    | 20                    | 20   | 25                                   | 25   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04540958               | 9         | 9.0         | 18.2                         | 18.2  | 20                         | 20    | 20                    | 20   | 25                                   | 25   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04541858               | 18        | 18.1        | 26.8                         | 26.8  | 29                         | 29    | 30                    | 30   | 30                                   | 30   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04542458               | 24        | 24.1        | 34                           | 34    | 36.2                       | 36.2  | 35                    | 35   | 40                                   | 40   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04543658               | 34        | 34.1        | 46                           | 46    | 48.3                       | 48.3  | 50                    | 50   | 50                                   | 50   |      |      |

**TABLE 15: ELECTRICAL DATA DH102 (8-1/2 TON) HIGH EFFICIENCY WITH PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |         | OD Fan Motors | Supply Blower Motor FLA |      | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |      | Max Fuse Size w/Power Exhaust (Amps) |      |      |      |
|---------|-------------|---------|---------------|-------------------------|------|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|------|--------------------------------------|------|------|------|
|         | RLA ea.     | LRA ea. | FLA ea.       | 3 HP                    | 3 HP | FLA           | FLA             |                           |           |             | 3 HP                         | 3 HP  | 3 HP                       | 3 HP  | 3 HP                  | 3 HP | 3 HP                                 | 3 HP | 3 HP | 3 HP |
|         | 208         | 11.7    | 88.0          | 3.5                     | 10.9 | 10.9          | 5.5             |                           |           |             | 10.0                         | None  | --                         | --    | 54.2                  | 54.2 | 59.7                                 | 59.7 | 60   | 60   |
|         |             |         |               |                         |      |               |                 | 2TP04540925               | 6.8       | 18.9        | 54.2                         | 54.2  | 59.7                       | 59.7  | 60                    | 60   | 70                                   | 70   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04541825               | 13.5      | 37.5        | 73.0                         | 73.0  | 79.8                       | 79.8  | 80                    | 80   | 80                                   | 80   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04542425               | 18        | 50.0        | 88.6                         | 88.6  | 95.5                       | 95.5  | 90                    | 90   | 100                                  | 100  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04543625               | 25.5      | 70.8        | 114.6                        | 114.6 | 121.5                      | 121.5 | 125                   | 125  | 125                                  | 125  |      |      |
| 230     | 11.7        | 88.0    | 3.5           | 10.9                    | 10.9 | 5.5           | 10.0            | None                      | --        | --          | 54.2                         | 54.2  | 59.7                       | 59.7  | 60                    | 60   | 70                                   | 70   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04540925               | 9         | 21.7        | 54.2                         | 54.2  | 59.7                       | 59.7  | 60                    | 60   | 70                                   | 70   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04541825               | 18        | 43.3        | 80.3                         | 80.3  | 87.1                       | 87.1  | 90                    | 90   | 90                                   | 90   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04542425               | 24        | 57.7        | 98.3                         | 98.3  | 105.2                      | 105.2 | 100                   | 100  | 110                                  | 110  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04543625               | 34        | 81.8        | 128.4                        | 128.4 | 135.2                      | 135.2 | 150                   | 150  | 150                                  | 150  |      |      |
| 460     | 6.4         | 42.0    | 1.6           | 5.3                     | 5.3  | 2.2           | 10.0            | None                      | --        | --          | 27.9                         | 27.9  | 30.1                       | 30.1  | 30                    | 30   | 35                                   | 35   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04540946               | 9         | 11.3        | 27.9                         | 27.9  | 30.1                       | 30.1  | 30                    | 30   | 35                                   | 35   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04541846               | 18        | 22.6        | 39.9                         | 39.9  | 42.7                       | 42.7  | 40                    | 40   | 45                                   | 45   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04542446               | 24        | 30.1        | 49                           | 49    | 51.7                       | 51.7  | 50                    | 50   | 60                                   | 60   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04543646               | 34        | 42.7        | 64                           | 64    | 66.7                       | 66.7  | 70                    | 70   | 70                                   | 70   |      |      |
| 575     | 5.1         | 36.0    | 1.3           | 4.1                     | 4.1  | 1.8           | 10.0            | None                      | --        | --          | 22.2                         | 22.2  | 24                         | 24    | 25                    | 25   | 25                                   | 25   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04540958               | 9         | 9.0         | 22.2                         | 22.2  | 24                         | 24    | 25                    | 25   | 25                                   | 25   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04541858               | 18        | 18.1        | 31.8                         | 31.8  | 34                         | 34    | 35                    | 35   | 35                                   | 35   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04542458               | 24        | 24.1        | 39                           | 39    | 41.2                       | 41.2  | 40                    | 40   | 45                                   | 45   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04543658               | 34        | 34.1        | 51                           | 51    | 53.3                       | 53.3  | 60                    | 60   | 60                                   | 60   |      |      |

**TABLE 16: ELECTRICAL DATA DH120 (10 TON) HIGH EFFICIENCY W/O PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |         | OD Fan Motors | Supply Blower Motor FLA |      | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |      | Max Fuse* Size w/Power Exhaust (Amps) |      |      |      |
|---------|-------------|---------|---------------|-------------------------|------|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|------|---------------------------------------|------|------|------|
|         | RLA ea.     | LRA ea. | FLA ea.       | 2 HP                    | 3 HP | FLA           | FLA             |                           |           |             | 2 HP                         | 3 HP  | 2 HP                       | 3 HP  | 2 HP                  | 3 HP | 2 HP                                  | 3 HP | 2 HP | 3 HP |
|         |             |         |               |                         |      |               |                 |                           |           |             |                              |       |                            |       |                       |      |                                       |      |      |      |
| 208     | 16.0        | 137.0   | 3.5           | 8.2                     | 10.9 | 5.5           | 0.0             | None                      | --        | --          | 51.2                         | 53.9  | 56.7                       | 59.4  | 60                    | 60   | 70                                    | 70   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04521825               | 13.5      | 37.5        | 57.1                         | 60.5  | 64.0                       | 67.3  | 60                    | 70   | 70                                    | 70   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04522425               | 18        | 50.0        | 72.7                         | 76.1  | 79.6                       | 83.0  | 80                    | 80   | 80                                    | 90   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04523625               | 25.5      | 70.8        | 98.7                         | 102.1 | 105.6                      | 109.0 | 100                   | 110  | 110                                   | 110  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04525425               | 40.6      | 112.7       | 151.1                        | 154.5 | 158.0                      | 161.4 | 175                   | 175  | 175                                   | 175  |      |      |
| 230     | 16.0        | 137.0   | 3.5           | 8.2                     | 10.9 | 5.5           | 0.0             | None                      | --        | --          | 51.2                         | 53.9  | 56.7                       | 59.4  | 60                    | 60   | 70                                    | 70   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04521825               | 18        | 43.3        | 64.4                         | 67.8  | 71.3                       | 74.6  | 70                    | 70   | 80                                    | 80   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04522425               | 24        | 57.7        | 82.4                         | 85.8  | 89.3                       | 92.7  | 90                    | 90   | 90                                    | 100  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04523625               | 34        | 81.8        | 112.5                        | 115.9 | 119.4                      | 122.7 | 125                   | 125  | 125                                   | 125  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04525425               | 54        | 129.9       | 140.2                        | 143.5 | 147.0                      | 150.4 | 150                   | 175  | 175                                   | 175  |      |      |
| 460     | 8.3         | 69.0    | 1.6           | 4.1                     | 5.3  | 2.2           | 0.0             | None                      | --        | --          | 26                           | 27.2  | 28.2                       | 29.4  | 30                    | 35   | 35                                    | 35   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04521846               | 18        | 22.6        | 32.2                         | 33.7  | 34.9                       | 36.4  | 35                    | 35   | 35                                    | 40   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04522446               | 24        | 30.1        | 41.2                         | 42.7  | 44                         | 45.5  | 45                    | 45   | 45                                    | 50   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04523646               | 34        | 42.7        | 56.2                         | 57.7  | 59                         | 60.5  | 60                    | 60   | 60                                    | 70   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04525446               | 54        | 67.8        | 70.1                         | 71.6  | 72.8                       | 74.3  | 80                    | 80   | 80                                    | 80   |      |      |
| 575     | 6.4         | 58.0    | 1.3           | 3.6                     | 4.1  | 1.8           | 0.0             | None                      | --        | --          | 20.6                         | 21.1  | 22.4                       | 22.9  | 25                    | 25   | 25                                    | 25   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04521858               | 18        | 18.1        | 26.2                         | 26.8  | 28.4                       | 29    | 30                    | 30   | 30                                    | 30   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04522458               | 24        | 24.1        | 33.4                         | 34    | 35.6                       | 36.2  | 35                    | 35   | 40                                    | 40   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04523658               | 34        | 34.1        | 45.4                         | 46    | 47.6                       | 48.3  | 50                    | 50   | 50                                    | 50   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04525458               | 54        | 54.2        | 56.5                         | 57.1  | 58.7                       | 59.3  | 70                    | 70   | 70                                    | 70   |      |      |

\* Maximum HACR breaker of the same AMP size is applicable.

**TABLE 17: ELECTRICAL DATA DH120 (10 TON) HIGH EFFICIENCY WITH PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |         | OD Fan Motors | Supply Blower Motor FLA |      | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |      | Max Fuse* Size w/Power Exhaust (Amps) |      |      |      |
|---------|-------------|---------|---------------|-------------------------|------|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|------|---------------------------------------|------|------|------|
|         | RLA ea.     | LRA ea. | FLA ea.       | 2 HP                    | 3 HP | FLA           | FLA             |                           |           |             | 2 HP                         | 3 HP  | 2 HP                       | 3 HP  | 2 HP                  | 3 HP | 2 HP                                  | 3 HP | 2 HP | 3 HP |
|         |             |         |               |                         |      |               |                 |                           |           |             |                              |       |                            |       |                       |      |                                       |      |      |      |
| 208     | 16.0        | 137.0   | 3.5           | 8.2                     | 10.9 | 5.5           | 10.0            | None                      | --        | --          | 61.2                         | 63.9  | 66.7                       | 69.4  | 70                    | 70   | 80                                    | 80   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04521825               | 13.5      | 37.5        | 69.6                         | 73.0  | 76.5                       | 79.8  | 70                    | 80   | 80                                    | 80   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04522425               | 18        | 50.0        | 85.2                         | 88.6  | 92.1                       | 95.5  | 90                    | 90   | 100                                   | 100  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04523625               | 25.5      | 70.8        | 111.2                        | 114.6 | 118.1                      | 121.5 | 125                   | 125  | 125                                   | 125  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04525425               | 40.6      | 112.7       | 163.6                        | 167.0 | 170.5                      | 173.9 | 175                   | 175  | 175                                   | 175  |      |      |
| 230     | 16.0        | 137.0   | 3.5           | 8.2                     | 10.9 | 5.5           | 10.0            | None                      | --        | --          | 61.2                         | 63.9  | 66.7                       | 69.4  | 70                    | 70   | 80                                    | 80   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04521825               | 18        | 43.3        | 76.9                         | 80.3  | 83.8                       | 87.1  | 80                    | 90   | 90                                    | 90   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04522425               | 24        | 57.7        | 94.9                         | 98.3  | 101.8                      | 105.2 | 100                   | 100  | 110                                   | 110  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04523625               | 34        | 81.8        | 125.0                        | 128.4 | 131.9                      | 135.2 | 125                   | 150  | 150                                   | 150  |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04525425               | 54        | 129.9       | 152.7                        | 156.0 | 159.5                      | 162.9 | 175                   | 175  | 175                                   | 175  |      |      |
| 460     | 8.3         | 69.0    | 1.6           | 4.1                     | 5.3  | 2.2           | 5.0             | None                      | --        | --          | 31                           | 32.2  | 33.2                       | 34.4  | 35                    | 40   | 40                                    | 40   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04521846               | 18        | 22.6        | 38.4                         | 39.9  | 41.2                       | 42.7  | 40                    | 40   | 45                                    | 45   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04522446               | 24        | 30.1        | 47.5                         | 49    | 50.2                       | 51.7  | 50                    | 50   | 60                                    | 60   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04523646               | 34        | 42.7        | 62.5                         | 64    | 65.2                       | 66.7  | 70                    | 70   | 70                                    | 70   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04525446               | 54        | 67.8        | 76.3                         | 77.8  | 79.1                       | 80.6  | 90                    | 90   | 90                                    | 90   |      |      |
| 575     | 6.4         | 58.0    | 1.3           | 3.6                     | 4.1  | 1.8           | 4.0             | None                      | --        | --          | 24.6                         | 25.1  | 26.4                       | 26.9  | 30                    | 30   | 30                                    | 30   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04521858               | 18        | 18.1        | 31.2                         | 31.8  | 33.4                       | 34    | 35                    | 35   | 35                                    | 35   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04522458               | 24        | 24.1        | 38.4                         | 39    | 40.6                       | 41.2  | 40                    | 40   | 45                                    | 45   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04523658               | 34        | 34.1        | 50.4                         | 51    | 52.6                       | 53.3  | 60                    | 60   | 60                                    | 60   |      |      |
|         |             |         |               |                         |      |               |                 | 2TP04525458               | 54        | 54.2        | 61.5                         | 62.1  | 63.7                       | 64.3  | 70                    | 70   | 70                                    | 70   |      |      |

\* Maximum HACR breaker of the same AMP size is applicable.

**TABLE 18: ELECTRICAL DATA DH150 (12-1/2 TON) HIGH EFFICIENCY W/O PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |         | OD Fan Motors | Supply Blower Motor FLA |      | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |      | Max Fuse* Size w/Power Exhaust (Amps) |      |
|---------|-------------|---------|---------------|-------------------------|------|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|------|---------------------------------------|------|
|         | RLA ea.     | LRA ea. | FLA ea.       | 3 HP                    | 5 HP | FLA           | FLA             |                           |           |             | 3 HP                         | 5 HP  | 3 HP                       | 5 HP  | 3 HP                  | 5 HP | 3 HP                                  | 5 HP |
|         |             |         |               |                         |      |               |                 |                           |           |             |                              |       |                            |       |                       |      |                                       |      |
| 208     | 18.9        | 146.0   | 3.5           | 10.9                    | 16.1 | 5.5           | 0.0             | None                      | --        | --          | 60.4                         | 65.6  | 65.9                       | 71.1  | 70                    | 80   | 80                                    | 90   |
|         |             |         |               |                         |      |               |                 | 2TP04521825               | 13.5      | 37.5        | 60.5                         | 67.0  | 67.3                       | 73.8  | 70                    | 80   | 80                                    | 90   |
|         |             |         |               |                         |      |               |                 | 2TP04522425               | 18        | 50.0        | 76.1                         | 82.6  | 83.0                       | 89.5  | 80                    | 90   | 90                                    | 90   |
|         |             |         |               |                         |      |               |                 | 2TP04523625               | 25.5      | 70.8        | 102.1                        | 108.6 | 109.0                      | 115.5 | 110                   | 110  | 110                                   | 125  |
|         |             |         |               |                         |      |               |                 | 2TP04525425               | 40.6      | 112.7       | 154.5                        | 161.0 | 161.4                      | 167.9 | 175                   | 175  | 175                                   | 175  |
| 230     | 18.9        | 146.0   | 3.5           | 10.9                    | 16.1 | 5.5           | 0.0             | None                      | --        | --          | 60.4                         | 65.6  | 65.9                       | 71.1  | 70                    | 80   | 80                                    | 90   |
|         |             |         |               |                         |      |               |                 | 2TP04521825               | 18        | 43.3        | 67.8                         | 74.3  | 74.6                       | 81.1  | 70                    | 80   | 80                                    | 90   |
|         |             |         |               |                         |      |               |                 | 2TP04522425               | 24        | 57.7        | 85.8                         | 92.3  | 92.7                       | 99.2  | 90                    | 100  | 100                                   | 100  |
|         |             |         |               |                         |      |               |                 | 2TP04523625               | 34        | 81.8        | 115.9                        | 122.4 | 122.7                      | 129.2 | 125                   | 125  | 125                                   | 150  |
|         |             |         |               |                         |      |               |                 | 2TP04525425               | 54        | 129.9       | 143.5                        | 150.0 | 150.4                      | 156.9 | 175                   | 175  | 175                                   | 175  |
| 460     | 9.5         | 73.0    | 1.6           | 5.3                     | 8.1  | 2.2           | 0.0             | None                      | --        | --          | 29.9                         | 32.7  | 32.1                       | 34.9  | 35                    | 40   | 40                                    | 40   |
|         |             |         |               |                         |      |               |                 | 2TP04521846               | 18        | 22.6        | 33.7                         | 37.2  | 36.4                       | 39.9  | 35                    | 40   | 40                                    | 40   |
|         |             |         |               |                         |      |               |                 | 2TP04522446               | 24        | 30.1        | 42.7                         | 46.2  | 45.5                       | 49    | 45                    | 50   | 50                                    | 50   |
|         |             |         |               |                         |      |               |                 | 2TP04523646               | 34        | 42.7        | 57.7                         | 61.2  | 60.5                       | 64    | 60                    | 70   | 70                                    | 70   |
|         |             |         |               |                         |      |               |                 | 2TP04525446               | 54        | 67.8        | 71.6                         | 75.1  | 74.3                       | 77.8  | 80                    | 90   | 80                                    | 90   |
| 575     | 7.6         | 58.4    | 1.3           | 4.1                     | 6.0  | 1.8           | 0.0             | None                      | --        | --          | 23.8                         | 25.7  | 25.6                       | 27.5  | 30                    | 30   | 30                                    | 35   |
|         |             |         |               |                         |      |               |                 | 2TP04521858               | 18        | 18.1        | 26.8                         | 29.2  | 29                         | 31.4  | 30                    | 30   | 30                                    | 35   |
|         |             |         |               |                         |      |               |                 | 2TP04522458               | 24        | 24.1        | 34                           | 36.4  | 36.2                       | 38.6  | 35                    | 40   | 40                                    | 40   |
|         |             |         |               |                         |      |               |                 | 2TP04523658               | 34        | 34.1        | 46                           | 48.4  | 48.3                       | 50.6  | 50                    | 50   | 50                                    | 60   |
|         |             |         |               |                         |      |               |                 | 2TP04525458               | 54        | 54.2        | 57.1                         | 59.5  | 59.3                       | 61.7  | 70                    | 70   | 70                                    | 70   |

\* Maximum HACR breaker of the same AMP size is applicable.

**TABLE 19: ELECTRICAL DATA DH150 (12-1/2 TON) HIGH EFFICIENCY W/PWRD CONVENIENCE OUTLET**

| Voltage | Compressors |         | OD Fan Motors | Supply Blower Motor FLA |      | Pwr Exh Motor | Pwr Conv Outlet | Electric Heater Model No. | Actual KW | Heater Amps | Min. Circuit Ampacity (Amps) |       | MCA w/Power Exhaust (Amps) |       | Max Fuse* Size (Amps) |      | Max Fuse* Size w/Power Exhaust (Amps) |      |
|---------|-------------|---------|---------------|-------------------------|------|---------------|-----------------|---------------------------|-----------|-------------|------------------------------|-------|----------------------------|-------|-----------------------|------|---------------------------------------|------|
|         | RLA ea.     | LRA ea. | FLA ea.       | 3 HP                    | 5 HP | FLA           | FLA             |                           |           |             | 3 HP                         | 5 HP  | 3 HP                       | 5 HP  | 3 HP                  | 5 HP | 3 HP                                  | 5 HP |
|         |             |         |               |                         |      |               |                 |                           |           |             |                              |       |                            |       |                       |      |                                       |      |
| 208     | 18.9        | 146.0   | 3.5           | 10.9                    | 16.1 | 5.5           | 10.0            | None                      | --        | --          | 70.4                         | 75.6  | 75.9                       | 81.1  | 80                    | 90   | 90                                    | 100  |
|         |             |         |               |                         |      |               |                 | 2TP04521825               | 13.5      | 37.5        | 73.0                         | 79.5  | 79.8                       | 86.3  | 80                    | 90   | 90                                    | 100  |
|         |             |         |               |                         |      |               |                 | 2TP04522425               | 18        | 50.0        | 88.6                         | 95.1  | 95.5                       | 102.0 | 90                    | 100  | 100                                   | 110  |
|         |             |         |               |                         |      |               |                 | 2TP04523625               | 25.5      | 70.8        | 114.6                        | 121.1 | 121.5                      | 128.0 | 125                   | 125  | 125                                   | 150  |
|         |             |         |               |                         |      |               |                 | 2TP04525425               | 40.6      | 112.7       | 167.0                        | 173.5 | 173.9                      | 180.4 | 175                   | 175  | 175                                   | 200  |
| 230     | 18.9        | 146.0   | 3.5           | 10.9                    | 16.1 | 5.5           | 10.0            | None                      | --        | --          | 70.4                         | 75.6  | 75.9                       | 81.1  | 80                    | 90   | 90                                    | 100  |
|         |             |         |               |                         |      |               |                 | 2TP04521825               | 18        | 43.3        | 80.3                         | 86.8  | 87.1                       | 93.6  | 90                    | 90   | 90                                    | 100  |
|         |             |         |               |                         |      |               |                 | 2TP04522425               | 24        | 57.7        | 98.3                         | 104.8 | 105.2                      | 111.7 | 100                   | 110  | 110                                   | 125  |
|         |             |         |               |                         |      |               |                 | 2TP04523625               | 34        | 81.8        | 128.4                        | 134.9 | 135.2                      | 141.7 | 150                   | 150  | 150                                   | 150  |
|         |             |         |               |                         |      |               |                 | 2TP04525425               | 54        | 129.9       | 156.0                        | 162.5 | 162.9                      | 169.4 | 175                   | 175  | 175                                   | 175  |
| 460     | 9.5         | 73.0    | 1.6           | 5.3                     | 8.1  | 2.2           | 5.0             | None                      | --        | --          | 34.9                         | 37.7  | 37.1                       | 39.9  | 40                    | 45   | 45                                    | 45   |
|         |             |         |               |                         |      |               |                 | 2TP04521846               | 18        | 22.6        | 39.9                         | 43.4  | 42.7                       | 46.2  | 40                    | 45   | 45                                    | 50   |
|         |             |         |               |                         |      |               |                 | 2TP04522446               | 24        | 30.1        | 49                           | 52.5  | 51.7                       | 55.2  | 50                    | 60   | 60                                    | 60   |
|         |             |         |               |                         |      |               |                 | 2TP04523646               | 34        | 42.7        | 64                           | 67.5  | 66.7                       | 70.2  | 70                    | 70   | 70                                    | 80   |
|         |             |         |               |                         |      |               |                 | 2TP04525446               | 54        | 67.8        | 77.8                         | 81.3  | 80.6                       | 84.1  | 90                    | 90   | 90                                    | 90   |
| 575     | 7.6         | 58.4    | 1.3           | 4.1                     | 6.0  | 1.8           | 4.0             | None                      | --        | --          | 27.8                         | 29.7  | 29.6                       | 31.5  | 35                    | 35   | 35                                    | 35   |
|         |             |         |               |                         |      |               |                 | 2TP04521858               | 18        | 18.1        | 31.8                         | 34.2  | 34                         | 36.4  | 35                    | 35   | 35                                    | 40   |
|         |             |         |               |                         |      |               |                 | 2TP04522458               | 24        | 24.1        | 39                           | 41.4  | 41.2                       | 43.6  | 40                    | 45   | 45                                    | 45   |
|         |             |         |               |                         |      |               |                 | 2TP04523658               | 34        | 34.1        | 51                           | 53.4  | 53.3                       | 55.6  | 60                    | 60   | 60                                    | 60   |
|         |             |         |               |                         |      |               |                 | 2TP04525458               | 54        | 54.2        | 62.1                         | 64.5  | 64.3                       | 66.7  | 70                    | 70   | 70                                    | 70   |

\* Maximum HACR breaker of the same AMP size is applicable.

**TABLE 20: ELECTRIC HEAT MULTIPLIERS**

| VOLTAGE |        | kW Cap. Multiplier |
|---------|--------|--------------------|
| NOMINAL | RATING |                    |
| 240     | 208    | 0.75               |
|         | 230    | 0.92               |
| 480     | 460    | 0.92               |
| 600     | 575    | 0.92               |

**NOTE:** Electric heaters are rated at nominal voltage. Use this table to determine the electric heat capacity for heaters supplied at lower voltages.

**NOTES FOR TABLES 21 THROUGH TABLE 30:**

- Blower performance includes dry coil and 2" throwaway filters.
- Blower performance for gas heat includes the maximum number of heat tubes available for each tonnage.

ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

**TABLE 21: DH078 (6-1/2) SIDE SHOT BLOWER PERFORMANCE**

| CFM  | External Static Pressure |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |      |      |      |      |      |      |      |      |
|------|--------------------------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|------|------|------|------|------|------|------|------|
|      | 0.2                      |       | 0.4  |      | 0.6   |      | 0.8  |       | 1.0  |      | 1.2   |      | 1.4  |       | 1.6  |      | 1.8   |      | 2.0  |       |      |      |      |      |      |      |      |      |      |      |
|      | RPM                      | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts |      |      |      |      |      |      |      |      |      |      |
| 1800 | 705                      | 0.31  | 291  | 776  | 0.50  | 466  | 844  | 0.67  | 622  | 910  | 0.82  | 761  | 977  | 0.95  | 888  | 1045 | 1.08  | 1005 | 1116 | 1.20  | 1115 | 1192 | 1.31 | 1220 | 1274 | 1.42 | 1324 | 1364 | 1.53 | 1429 |
| 1900 | 719                      | 0.37  | 347  | 790  | 0.56  | 522  | 858  | 0.73  | 677  | 924  | 0.88  | 817  | 991  | 1.01  | 944  | 1059 | 1.14  | 1061 | 1130 | 1.26  | 1171 | 1206 | 1.37 | 1276 | 1288 | 1.48 | 1380 | 1378 | 1.59 | 1485 |
| 2000 | 734                      | 0.44  | 408  | 805  | 0.62  | 582  | 873  | 0.79  | 738  | 939  | 0.94  | 878  | 1006 | 1.08  | 1005 | 1074 | 1.20  | 1121 | 1146 | 1.32  | 1231 | 1221 | 1.43 | 1336 | 1304 | 1.54 | 1440 | 1393 | 1.66 | 1545 |
| 2100 | 751                      | 0.51  | 472  | 822  | 0.69  | 647  | 889  | 0.86  | 802  | 956  | 1.01  | 942  | 1023 | 1.15  | 1069 | 1091 | 1.27  | 1186 | 1162 | 1.39  | 1296 | 1238 | 1.50 | 1401 | 1320 | 1.61 | 1505 | 1410 | 1.73 | 1610 |
| 2200 | 768                      | 0.58  | 541  | 839  | 0.77  | 716  | 907  | 0.93  | 871  | 974  | 1.08  | 1011 | 1040 | 1.22  | 1138 | 1108 | 1.35  | 1255 | 1180 | 1.46  | 1364 | 1256 | 1.58 | 1470 | 1338 | 1.69 | 1574 | 1375 | 1.84 | 1717 |
| 2300 | 787                      | 0.66  | 614  | 858  | 0.85  | 789  | 926  | 1.01  | 945  | 992  | 1.16  | 1084 | 1059 | 1.30  | 1211 | 1127 | 1.42  | 1328 | 1198 | 1.54  | 1438 | 1274 | 1.66 | 1543 | 1270 | 1.80 | 1674 | 1326 | 1.92 | 1793 |
| 2400 | 807                      | 0.74  | 692  | 878  | 0.93  | 866  | 946  | 1.10  | 1022 | 1012 | 1.25  | 1162 | 1079 | 1.38  | 1289 | 1147 | 1.51  | 1405 | 1218 | 1.63  | 1515 | 1294 | 1.74 | 1620 | 1284 | 1.88 | 1757 | 1341 | 2.01 | 1875 |
| 2500 | 828                      | 0.83  | 773  | 899  | 1.02  | 948  | 966  | 1.18  | 1103 | 1033 | 1.33  | 1243 | 1100 | 1.47  | 1370 | 1168 | 1.59  | 1487 | 1239 | 1.71  | 1596 | 1246 | 1.85 | 1725 | 1300 | 1.98 | 1844 | 1366 | 2.14 | 1962 |
| 2600 | 849                      | 0.92  | 858  | 920  | 1.11  | 1033 | 988  | 1.28  | 1189 | 1055 | 1.43  | 1328 | 1121 | 1.56  | 1455 | 1189 | 1.69  | 1572 | 1209 | 1.82  | 1694 | 1263 | 1.95 | 1816 | 1317 | 2.08 | 1995 | 1373 | 2.20 | 2053 |
| 2700 | 872                      | 1.02  | 948  | 943  | 1.20  | 1122 | 1011 | 1.37  | 1278 | 1077 | 1.52  | 1418 | 1144 | 1.66  | 1544 | 1174 | 1.76  | 1661 | 1228 | 1.92  | 1789 | 1281 | 2.05 | 1911 | 1335 | 2.18 | 2030 | 1392 | 2.30 | 2148 |
| 2800 | 896                      | 1.12  | 1041 | 966  | 1.30  | 1215 | 1034 | 1.47  | 1371 | 1101 | 1.62  | 1511 | 1139 | 1.74  | 1624 | 1193 | 1.89  | 1760 | 1247 | 2.03  | 1888 | 1300 | 2.16 | 2010 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |
| 2900 | 920                      | 1.22  | 1137 | 991  | 1.41  | 1312 | 1059 | 1.57  | 1467 | 1125 | 1.72  | 1607 | 1159 | 1.85  | 1726 | 1213 | 2.00  | 1862 | 1266 | 2.13  | 1990 | 1320 | 2.27 | 2112 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |
| 3000 | 945                      | 1.33  | 1237 | 1016 | 1.51  | 1412 | 1084 | 1.68  | 1567 | 1125 | 1.81  | 1684 | 1180 | 1.96  | 1832 | 1234 | 2.11  | 1968 | 1287 | 2.25  | 2095 | 1320 | 2.27 | 2112 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |
| 3100 | 971                      | 1.44  | 1341 | 1042 | 1.63  | 1515 | 1090 | 1.75  | 1633 | 1147 | 1.92  | 1793 | 1202 | 2.08  | 1940 | 1255 | 2.23  | 2077 | 1287 | 2.25  | 2095 | 1320 | 2.27 | 2112 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |
| 3200 | 998                      | 1.55  | 1448 | 1069 | 1.74  | 1623 | 1112 | 1.97  | 1743 | 1169 | 2.04  | 1905 | 1224 | 2.20  | 2052 | 1287 | 2.25  | 2095 | 1320 | 2.27  | 2112 | 1355 | 2.28 | 2112 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |
| 3300 | 1025                     | 1.67  | 1558 | 1076 | 1.80  | 1680 | 1135 | 1.99  | 1858 | 1192 | 2.17  | 2020 | 1247 | 2.33  | 2167 | 1287 | 2.25  | 2095 | 1320 | 2.27  | 2112 | 1355 | 2.28 | 2112 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |
| 3400 | 1037                     | 1.72  | 1599 | 1100 | 1.93  | 1797 | 1159 | 2.12  | 1976 | 1216 | 2.28  | 2138 | 1287 | 2.25  | 2095 | 1320 | 2.27  | 2112 | 1355 | 2.28  | 2112 | 1355 | 2.28 | 2112 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |
| 3500 | 1062                     | 1.85  | 1720 | 1124 | 2.06  | 1918 | 1183 | 2.25  | 2097 | 1287 | 2.25  | 2095 | 1320 | 2.27  | 2112 | 1355 | 2.28  | 2112 | 1355 | 2.28  | 2112 | 1355 | 2.28 | 2112 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |
| 3600 | 1087                     | 1.98  | 1843 | 1149 | 2.19  | 2042 | 1211 | 2.38  | 2211 | 1355 | 2.28  | 2112 | 1355 | 2.28  | 2112 | 1355 | 2.28  | 2112 | 1355 | 2.28  | 2112 | 1355 | 2.28 | 2112 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |
| 3700 | 1112                     | 2.11  | 1966 | 1175 | 2.33  | 2168 | 1287 | 2.25  | 2095 | 1320 | 2.27  | 2112 | 1355 | 2.28  | 2112 | 1355 | 2.28  | 2112 | 1355 | 2.28  | 2112 | 1355 | 2.28 | 2112 | 1355 | 2.28 | 2030 | 1392 | 2.30 | 2148 |

High Horsepower Option Required



TABLE 22: DH090 (7-1/2 TON) SIDE SHOT BLOWER PERFORMANCE

| CFM  | External Static Pressure |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |      |      |      |      |      |      |      |   |   |   |   |
|------|--------------------------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|------|------|------|------|------|------|------|---|---|---|---|
|      | 0.2                      |      | 0.4   |      | 0.6  |       | 0.8  |      | 1.0   |      | 1.2  |       | 1.4  |      | 1.6   |      | 1.8  |       | 2    |      |       |      |      |      |      |      |      |      |      |      |   |   |   |   |
|      | RPM                      | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts |      |      |      |      |      |      |      |      |      |   |   |   |   |
| 2000 | 745                      | 0.31 | 292   | 811  | 0.51 | 478   | 876  | 0.71 | 658   | 939  | 0.89 | 827   | 1001 | 1.05 | 980   | 1061 | 1.19 | 1113  | 1118 | 1.21 | 1221  | 1174 | 1.46 | 1361 | 1227 | 1.59 | 1486 | 1278 | 1.74 | 1622 |   |   |   |   |
| 2100 | 759                      | 0.38 | 359   | 825  | 0.58 | 545   | 890  | 0.78 | 725   | 954  | 0.96 | 894   | 1015 | 1.12 | 1047  | 1075 | 1.27 | 1180  | 1133 | 1.38 | 1288  | 1188 | 1.54 | 1434 | 1241 | 1.67 | 1559 | 1292 | 1.82 | 1695 |   |   |   |   |
| 2200 | 774                      | 0.46 | 429   | 841  | 0.66 | 615   | 906  | 0.85 | 795   | 969  | 1.03 | 964   | 1031 | 1.20 | 1117  | 1090 | 1.34 | 1251  | 1148 | 1.46 | 1359  | 1204 | 1.62 | 1508 | 1257 | 1.75 | 1633 | 1307 | 1.90 | 1769 |   |   |   |   |
| 2300 | 791                      | 0.54 | 504   | 857  | 0.74 | 690   | 922  | 0.93 | 870   | 985  | 1.11 | 1039  | 1047 | 1.28 | 1192  | 1107 | 1.42 | 1325  | 1164 | 1.54 | 1433  | 1220 | 1.70 | 1584 | 1273 | 1.83 | 1709 | 1324 | 1.98 | 1845 |   |   |   |   |
| 2400 | 808                      | 0.62 | 582   | 874  | 0.82 | 768   | 939  | 1.02 | 948   | 1002 | 1.20 | 1117  | 1064 | 1.36 | 1270  | 1124 | 1.51 | 1403  | 1182 | 1.62 | 1511  | 1237 | 1.78 | 1664 | 1290 | 1.92 | 1789 | 1341 | 2.06 | 1925 |   |   |   |   |
| 2500 | 826                      | 0.71 | 664   | 892  | 0.91 | 850   | 957  | 1.11 | 1030  | 1020 | 1.29 | 1199  | 1082 | 1.45 | 1353  | 1142 | 1.59 | 1486  | 1200 | 1.71 | 1594  | 1255 | 1.87 | 1746 | 1308 | 2.01 | 1871 | 1359 | 2.15 | 2007 |   |   |   |   |
| 2600 | 845                      | 0.81 | 750   | 911  | 1.00 | 936   | 976  | 1.20 | 1116  | 1039 | 1.38 | 1285  | 1101 | 1.54 | 1438  | 1161 | 1.69 | 1571  | 1219 | 1.80 | 1680  | 1274 | 1.97 | 1832 | 1327 | 2.10 | 1957 | 1378 | 2.25 | 2093 |   |   |   |   |
| 2700 | 865                      | 0.90 | 840   | 931  | 1.10 | 1026  | 996  | 1.29 | 1206  | 1059 | 1.47 | 1375  | 1121 | 1.64 | 1528  | 1181 | 1.78 | 1661  | 1238 | 1.90 | 1769  | 1294 | 2.06 | 1922 | 1347 | 2.20 | 2046 | 1398 | 2.34 | 2183 |   |   |   |   |
| 2800 | 885                      | 1.00 | 933   | 952  | 1.20 | 1119  | 1016 | 1.39 | 1299  | 1080 | 1.58 | 1468  | 1141 | 1.74 | 1621  | 1201 | 1.88 | 1755  | 1259 | 2.00 | 1863  | 1314 | 2.16 | 2015 | 1368 | 2.30 | 2140 | 1419 | 2.44 | 2276 |   |   |   |   |
| 2900 | 907                      | 1.11 | 1030  | 973  | 1.30 | 1216  | 1038 | 1.50 | 1396  | 1101 | 1.68 | 1565  | 1163 | 1.84 | 1718  | 1222 | 1.99 | 1851  | 1280 | 2.10 | 1960  | 1336 | 2.27 | 2113 | 1389 | 2.40 | 2238 | 1439 | 2.55 | 2374 |   |   |   |   |
| 3000 | 929                      | 1.21 | 1131  | 995  | 1.41 | 1317  | 1060 | 1.61 | 1497  | 1123 | 1.79 | 1666  | 1185 | 1.95 | 1819  | 1244 | 2.09 | 1952  | 1302 | 2.21 | 2060  | 1358 | 2.38 | 2214 | 1411 | 2.51 | 2339 | 1461 | 2.66 | 2475 |   |   |   |   |
| 3100 | 951                      | 1.32 | 1235  | 1017 | 1.52 | 1421  | 1082 | 1.72 | 1601  | 1146 | 1.90 | 1769  | 1207 | 2.06 | 1923  | 1267 | 2.21 | 2056  | 1325 | 2.32 | 2164  | 1380 | 2.49 | 2320 | 1434 | 2.62 | 2445 | 1484 | 2.77 | 2581 |   |   |   |   |
| 3200 | 975                      | 1.44 | 1342  | 1041 | 1.64 | 1528  | 1106 | 1.83 | 1708  | 1169 | 2.01 | 1877  | 1231 | 2.18 | 2030  | 1290 | 2.32 | 2163  | 1348 | 2.46 | 2311  | 1404 | 2.61 | 2491 | 1457 | 2.74 | 2555 | 1507 | 2.89 | 2691 |   |   |   |   |
| 3300 | 999                      | 1.56 | 1453  | 1065 | 1.76 | 1639  | 1130 | 1.95 | 1819  | 1193 | 2.13 | 1987  | 1255 | 2.30 | 2141  | 1314 | 2.47 | 2304  | 1372 | 2.60 | 2425  | 1428 | 2.73 | 2542 | 1481 | 2.86 | 2670 | 1531 | 3.01 | 2806 |   |   |   |   |
| 3400 | 1023                     | 1.68 | 1567  | 1089 | 1.88 | 1753  | 1154 | 2.07 | 1932  | 1218 | 2.25 | 2101  | 1279 | 2.46 | 2293  | 1339 | 2.60 | 2422  | 1397 | 2.73 | 2542  | 1452 | 2.86 | 2664 | 1505 | 2.99 | 2789 | 1556 | 3.14 | 2925 |   |   |   |   |
| 3500 | 1048                     | 1.81 | 1684  | 1115 | 2.01 | 1870  | 1179 | 2.20 | 2049  | 1243 | 2.44 | 2273  | 1304 | 2.69 | 2416  | 1364 | 2.73 | 2546  | 1422 | 2.86 | 2667  | 1478 | 2.99 | 2787 | 1531 | 3.12 | 2912 | 1581 | 3.27 | 3048 |   |   |   |   |
| 3600 | 1074                     | 1.94 | 1804  | 1140 | 2.13 | 1990  | 1205 | 2.33 | 2170  | 1269 | 2.58 | 2401  | 1330 | 2.73 | 2544  | 1390 | 2.87 | 2673  | 1448 | 3.00 | 2794  | 1503 | 3.13 | 2914 | 1556 | 3.26 | 3039 | —    | —    | —    |   |   |   |   |
| 3700 | 1101                     | 2.07 | 1927  | 1167 | 2.27 | 2113  | 1232 | 2.54 | 2369  | 1295 | 2.72 | 2532  | 1357 | 2.87 | 2676  | 1416 | 3.01 | 2805  | 1474 | 3.14 | 2926  | 1530 | 3.27 | 3046 | 1583 | 3.40 | 3171 | —    | —    | —    |   |   |   |   |
| 3800 | 1127                     | 2.20 | 2053  | 1194 | 2.48 | 2315  | 1258 | 2.69 | 2505  | 1322 | 2.86 | 2669  | 1383 | 3.02 | 2812  | 1443 | 3.15 | 2841  | 1501 | 3.28 | 3062  | —    | —    | —    | —    | —    | —    | —    | —    | —    |   |   |   |   |
| 3900 | 1155                     | 2.39 | 2232  | 1221 | 2.63 | 2455  | 1286 | 2.84 | 2645  | 1349 | 3.01 | 2809  | 1411 | 3.17 | 2952  | 1474 | 3.31 | 3081  | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    | — |   |   |   |
| 4000 | 1183                     | 2.65 | 2374  | 1249 | 2.89 | 2600  | 1314 | 2.99 | 2790  | 1377 | 3.17 | 2953  | 1439 | 3.32 | 3097  | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    | — |   |   |   |
| 4100 | 1211                     | 2.74 | 2525  | 1277 | 2.95 | 2748  | 1342 | 3.15 | 2939  | 1406 | 3.33 | 3102  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    | — | — |   |   |
| 4200 | 1240                     | 2.87 | 2678  | 1306 | 3.11 | 2901  | 1371 | 3.32 | 3091  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    | — | — |   |   |
| 4300 | 1269                     | 3.04 | 2835  | 1336 | 3.28 | 3058  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    | — | — | — |   |
| 4400 | 1299                     | 3.21 | 2996  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    | — | — | — |   |
| 4500 | 1329                     | 3.39 | 3168  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    | — | — | — | — |

High Horsepower Option Required

**TABLE 23: DH102 (8-1/2 TON) SIDE SHOT BLOWER PERFORMANCE**

| CFM  | External Static Pressure |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |      |      |      |      |      |      |      |      |
|------|--------------------------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|------|------|------|------|------|------|------|------|
|      | 0.2                      |       | 0.4  |       | 0.6  |       | 0.8  |       | 1.0  |       | 1.2  |       | 1.4  |       | 1.6  |       | 1.8  |       |      |      |      |      |      |      |      |      |      |
|      | RPM                      | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts |      |      |      |      |      |      |      |      |      |
| 2000 | 802                      | 0.31  | 288  | 866   | 0.55 | 510   | 923  | 0.75  | 700  | 975   | 0.93 | 864   | 1025 | 1.08  | 1007 | 1074  | 1.22 | 1137  | 1124 | 1.35 | 1259 | 1178 | 1.48 | 1378 | 1237 | 1.61 | 1503 |
| 2100 | 813                      | 0.38  | 354  | 877   | 0.62 | 576   | 934  | 0.82  | 766  | 986   | 1.00 | 930   | 1036 | 1.15  | 1074 | 1085  | 1.29 | 1203  | 1135 | 1.42 | 1325 | 1189 | 1.55 | 1445 | 1248 | 1.68 | 1569 |
| 2200 | 825                      | 0.45  | 423  | 889   | 0.69 | 646   | 946  | 0.90  | 836  | 999   | 1.07 | 1000  | 1048 | 1.23  | 1143 | 1097  | 1.37 | 1273  | 1147 | 1.50 | 1394 | 1201 | 1.62 | 1514 | 1260 | 1.76 | 1638 |
| 2300 | 838                      | 0.53  | 497  | 902   | 0.77 | 719   | 959  | 0.98  | 909  | 1012  | 1.15 | 1073  | 1061 | 1.30  | 1216 | 1110  | 1.44 | 1346  | 1160 | 1.57 | 1467 | 1214 | 1.70 | 1587 | 1273 | 1.84 | 1712 |
| 2400 | 852                      | 0.62  | 573  | 916   | 0.85 | 796   | 973  | 1.06  | 986  | 1026  | 1.23 | 1150  | 1075 | 1.39  | 1293 | 1124  | 1.53 | 1423  | 1174 | 1.66 | 1544 | 1228 | 1.79 | 1664 | 1287 | 1.92 | 1788 |
| 2500 | 867                      | 0.70  | 654  | 931   | 0.94 | 877   | 988  | 1.14  | 1067 | 1040  | 1.32 | 1230  | 1090 | 1.47  | 1374 | 1139  | 1.61 | 1504  | 1189 | 1.74 | 1625 | 1243 | 1.87 | 1745 | 1302 | 2.01 | 1869 |
| 2600 | 882                      | 0.79  | 739  | 946   | 1.03 | 962   | 1004 | 1.24  | 1152 | 1056  | 1.41 | 1316  | 1105 | 1.57  | 1459 | 1154  | 1.70 | 1589  | 1204 | 1.83 | 1710 | 1258 | 1.96 | 1830 | 1318 | 2.10 | 1954 |
| 2700 | 899                      | 0.89  | 829  | 963   | 1.13 | 1051  | 1020 | 1.33  | 1241 | 1072  | 1.51 | 1405  | 1122 | 1.66  | 1548 | 1170  | 1.80 | 1678  | 1221 | 1.93 | 1800 | 1274 | 2.06 | 1919 | 1334 | 2.19 | 2044 |
| 2800 | 916                      | 0.99  | 922  | 980   | 1.23 | 1145  | 1037 | 1.43  | 1335 | 1089  | 1.61 | 1498  | 1139 | 1.76  | 1642 | 1187  | 1.90 | 1771  | 1238 | 2.03 | 1893 | 1292 | 2.16 | 2013 | 1328 | 2.28 | 2128 |
| 2900 | 934                      | 1.09  | 1020 | 998   | 1.33 | 1243  | 1055 | 1.54  | 1433 | 1107  | 1.71 | 1596  | 1156 | 1.87  | 1740 | 1205  | 2.01 | 1869  | 1255 | 2.14 | 1991 | 1309 | 2.26 | 2111 | 1346 | 2.40 | 2235 |
| 3000 | 952                      | 1.20  | 1122 | 1016  | 1.44 | 1345  | 1073 | 1.65  | 1535 | 1125  | 1.82 | 1698  | 1175 | 1.98  | 1842 | 1224  | 2.12 | 1972  | 1274 | 2.25 | 2093 | 1315 | 2.38 | 2215 | 1365 | 2.52 | 2347 |
| 3100 | 971                      | 1.32  | 1229 | 1035  | 1.56 | 1451  | 1092 | 1.76  | 1641 | 1145  | 1.94 | 1805  | 1194 | 2.09  | 1949 | 1243  | 2.23 | 2078  | 1293 | 2.36 | 2200 | 1335 | 2.50 | 2333 | 1395 | 2.64 | 2465 |
| 3200 | 991                      | 1.44  | 1340 | 1055  | 1.68 | 1562  | 1112 | 1.88  | 1752 | 1164  | 2.06 | 1916  | 1214 | 2.21  | 2059 | 1263  | 2.35 | 2189  | 1313 | 2.48 | 2311 | 1355 | 2.64 | 2456 | 1406 | 2.78 | 2588 |
| 3300 | 1012                     | 1.56  | 1455 | 1076  | 1.80 | 1677  | 1133 | 2.00  | 1867 | 1185  | 2.18 | 2031  | 1234 | 2.33  | 2175 | 1283  | 2.47 | 2304  | 1327 | 2.63 | 2450 | 1377 | 2.77 | 2594 | 1427 | 2.91 | 2716 |
| 3400 | 1033                     | 1.69  | 1574 | 1097  | 1.93 | 1797  | 1154 | 2.13  | 1987 | 1206  | 2.31 | 2151  | 1256 | 2.46  | 2294 | 1304  | 2.60 | 2424  | 1349 | 2.77 | 2583 | 1399 | 2.91 | 2717 | 1449 | 3.06 | 2849 |
| 3500 | 1054                     | 1.82  | 1698 | 1118  | 2.06 | 1921  | 1176 | 2.26  | 2111 | 1228  | 2.44 | 2274  | 1277 | 2.59  | 2418 | 1322  | 2.77 | 2578  | 1372 | 2.92 | 2720 | 1421 | 3.06 | 2854 | 1471 | 3.20 | 2986 |
| 3600 | 1077                     | 1.96  | 1826 | 1141  | 2.20 | 2048  | 1198 | 2.40  | 2238 | 1250  | 2.58 | 2402  | 1300 | 2.73  | 2546 | 1345  | 2.92 | 2720  | 1395 | 3.07 | 2861 | 1444 | 3.21 | 2966 | 1495 | 3.36 | 3128 |
| 3700 | 1100                     | 2.10  | 1958 | 1164  | 2.34 | 2180  | 1221 | 2.54  | 2370 | 1273  | 2.72 | 2534  | 1318 | 2.91  | 2711 | 1369  | 3.07 | 2865  | 1418 | 3.23 | 3007 | 1468 | 3.37 | 3141 | ---  | ---  | ---  |
| 3800 | 1123                     | 2.25  | 2094 | 1187  | 2.49 | 2316  | 1244 | 2.69  | 2506 | 1296  | 2.86 | 2670  | 1343 | 3.07  | 2861 | 1393  | 3.23 | 3015  | 1442 | 3.39 | 3156 | ---  | ---  | ---  | ---  | ---  | ---  |
| 3900 | 1147                     | 2.40  | 2234 | 1211  | 2.64 | 2457  | 1268 | 2.84  | 2647 | 1315  | 3.05 | 2843  | 1367 | 3.23  | 3014 | 1417  | 3.40 | 3168  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4000 | 1171                     | 2.55  | 2378 | 1236  | 2.79 | 2601  | 1293 | 2.99  | 2791 | 1340  | 3.22 | 2989  | 1392 | 3.40  | 3171 | ---   | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4100 | 1197                     | 2.71  | 2526 | 1261  | 2.95 | 2749  | 1311 | 3.18  | 2968 | 1365  | 3.39 | 3160  | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4200 | 1222                     | 2.87  | 2678 | 1286  | 3.11 | 2900  | 1337 | 3.36  | 3129 | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4300 | 1248                     | 3.04  | 2834 | 1306  | 3.30 | 3076  | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4400 | 1275                     | 3.21  | 2993 | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4500 | 1302                     | 3.39  | 3156 | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |

Optional Drive Required

TABLE 24: DH120 (10 TON) SIDE SHOT BLOWER PERFORMANCE

| CFM  | External Static Pressure |     |       |     |     |       |     |     |       |     |     |       |     |     |       |     |     |       |
|------|--------------------------|-----|-------|-----|-----|-------|-----|-----|-------|-----|-----|-------|-----|-----|-------|-----|-----|-------|
|      | 0.2                      |     | 0.4   |     | 0.6 |       | 0.8 |     | 1.0   |     | 1.2 |       | 1.4 |     | 1.6   |     | 1.8 |       |
|      | RPM                      | BHP | Watts | RPM | BHP | Watts | RPM | BHP | Watts | RPM | BHP | Watts | RPM | BHP | Watts | RPM | BHP | Watts |
| 3000 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 3100 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 3200 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 3300 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 3400 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 3500 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 3600 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 3700 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 3800 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 3900 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4000 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4100 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4200 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4300 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4400 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4500 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4600 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4700 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4800 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 4900 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |
| 5000 | ---                      | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   | --- | --- | ---   |

High Horsepower Option Required

TABLE 25: DH150 (12-1/2 TON) SIDE SHOT BLOWER PERFORMANCE

| CFM  | External Static Pressure |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |      |      |      |      |      |      |      |      |      |      |
|------|--------------------------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|------|------|------|------|------|------|------|------|------|------|
|      | 0.2                      |      | 0.4   |      | 0.6  |       | 0.8  |      | 1.0   |      | 1.2  |       | 1.4  |      | 1.6   |      | 1.8  |       | 2.0  |      |       |      |      |      |      |      |      |      |      |      |      |      |      |
|      | RPM                      | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts |      |      |      |      |      |      |      |      |      |      |      |      |
| 3700 | ---                      | ---  | ---   | ---  | ---  | ---   | 874  | 1.93 | 1801  | 927  | 2.04 | 1906  | 984  | 2.27 | 2113  | 1037 | 2.41 | 2245  | 1089 | 2.57 | 2399  | 1138 | 2.68 | 2499 | 1178 | 2.82 | 2628 |      |      |      |      |      |      |
| 3800 | ---                      | ---  | ---   | ---  | ---  | ---   | 840  | 1.82 | 1699  | 888  | 2.01 | 1871  | 941  | 2.14 | 1993  | 997  | 2.36 | 2202  | 1048 | 2.50 | 2334  | 1099 | 2.67 | 2485 | 1146 | 2.77 | 2586 | 1186 | 2.93 | 2728 |      |      |      |
| 3900 | ---                      | ---  | ---   | ---  | ---  | ---   | 855  | 1.92 | 1786  | 903  | 2.09 | 1947  | 954  | 2.24 | 2085  | 1009 | 2.46 | 2295  | 1060 | 2.60 | 2427  | 1109 | 2.76 | 2576 | 1155 | 2.88 | 2680 | 1195 | 3.04 | 2834 |      |      |      |
| 4000 | ---                      | ---  | ---   | ---  | ---  | ---   | 870  | 2.01 | 1877  | 917  | 2.18 | 2028  | 968  | 2.34 | 2182  | 1022 | 2.57 | 2392  | 1071 | 2.71 | 2524  | 1120 | 2.87 | 2672 | 1163 | 2.98 | 2780 | 1204 | 3.16 | 2947 |      |      |      |
| 4100 | ---                      | ---  | ---   | ---  | ---  | ---   | 885  | 2.12 | 1973  | 932  | 2.27 | 2115  | 982  | 2.45 | 2283  | 1035 | 2.68 | 2494  | 1083 | 2.82 | 2626  | 1130 | 2.98 | 2774 | 1171 | 3.10 | 2887 | 1212 | 3.29 | 3066 |      |      |      |
| 4200 | ---                      | ---  | ---   | ---  | ---  | ---   | 834  | 2.11 | 1970  | 900  | 2.22 | 2072  | 946  | 2.37 | 2207  | 996  | 2.56 | 2390  | 1048 | 2.79 | 2601  | 1094 | 2.93 | 2733 | 1140 | 3.09 | 2881 | 1179 | 3.22 | 3000 | 1221 | 3.42 | 3192 |
| 4300 | ---                      | ---  | ---   | ---  | ---  | ---   | 851  | 2.19 | 2042  | 915  | 2.33 | 2175  | 961  | 2.47 | 2305  | 1009 | 2.68 | 2501  | 1061 | 2.91 | 2712  | 1106 | 3.05 | 2844 | 1150 | 3.21 | 2993 | 1188 | 3.35 | 3119 | 1230 | 3.57 | 3324 |
| 4400 | ---                      | ---  | ---   | ---  | ---  | ---   | 868  | 2.28 | 2121  | 931  | 2.45 | 2283  | 975  | 2.58 | 2409  | 1023 | 2.81 | 2616  | 1074 | 3.03 | 2828  | 1117 | 3.18 | 2960 | 1160 | 3.34 | 3111 | 1196 | 3.48 | 3245 | 1239 | 3.74 | 3462 |
| 4500 | 822                      | 2.13 | 1990  | 885  | 2.37 | 2208  | 946  | 2.57 | 2395  | 990  | 2.70 | 2518  | 1037 | 2.94 | 2736  | 1087 | 3.16 | 2948  | 1129 | 3.30 | 3080  | 1171 | 3.47 | 3214 | 1224 | 3.62 | 3377 | 1247 | 3.87 | 3607 |      |      |      |
| 4600 | 838                      | 2.23 | 2083  | 901  | 2.47 | 2301  | 961  | 2.69 | 2511  | 1004 | 2.82 | 2633  | 1051 | 3.07 | 2862  | 1099 | 3.30 | 3072  | 1141 | 3.44 | 3204  | 1181 | 3.61 | 3362 | 1212 | 3.77 | 3515 | 1256 | 4.03 | 3758 |      |      |      |
| 4700 | 854                      | 2.34 | 2184  | 918  | 2.58 | 2401  | 976  | 2.82 | 2631  | 1019 | 2.95 | 2753  | 1064 | 3.21 | 2991  | 1112 | 3.43 | 3201  | 1152 | 3.58 | 3333  | 1191 | 3.75 | 3496 | 1223 | 3.93 | 3659 | 1265 | 4.20 | 3916 |      |      |      |
| 4800 | 870                      | 2.46 | 2291  | 935  | 2.69 | 2508  | 991  | 2.96 | 2755  | 1033 | 3.09 | 2879  | 1078 | 3.35 | 3126  | 1125 | 3.58 | 3335  | 1164 | 3.72 | 3467  | 1201 | 3.90 | 3635 | 1229 | 4.09 | 3810 | 1273 | 4.38 | 4080 |      |      |      |
| 4900 | 887                      | 2.58 | 2406  | 952  | 2.81 | 2622  | 1007 | 3.09 | 2883  | 1048 | 3.23 | 3011  | 1092 | 3.50 | 3265  | 1138 | 3.73 | 3473  | 1175 | 3.87 | 3605  | 1211 | 4.05 | 3779 | 1237 | 4.26 | 3967 | 1282 | 4.56 | 4260 |      |      |      |
| 5000 | 903                      | 2.71 | 2527  | 968  | 2.94 | 2744  | 1022 | 3.24 | 3016  | 1062 | 3.38 | 3148  | 1105 | 3.66 | 3409  | 1151 | 3.88 | 3616  | 1187 | 4.02 | 3748  | 1222 | 4.21 | 3929 | 1245 | 4.43 | 4131 | 1291 | 4.75 | 4427 |      |      |      |
| 5100 | 919                      | 2.85 | 2656  | 985  | 3.08 | 2872  | 1037 | 3.38 | 3152  | 1072 | 3.53 | 3293  | 1119 | 3.82 | 3558  | 1184 | 4.04 | 3763  | 1198 | 4.16 | 3895  | 1232 | 4.38 | 4083 | 1254 | 4.61 | 4307 | 1300 | 4.95 | 4610 |      |      |      |
| 5200 | 936                      | 2.99 | 2791  | 1002 | 3.23 | 3007  | 1052 | 3.53 | 3293  | 1091 | 3.68 | 3439  | 1133 | 3.98 | 3721  | 1177 | 4.20 | 3914  | 1210 | 4.34 | 4046  | 1242 | 4.55 | 4244 | 1262 | 4.80 | 4477 | 1308 | 5.15 | 4800 |      |      |      |
| 5300 | 952                      | 3.15 | 2934  | 1018 | 3.38 | 3149  | 1067 | 3.69 | 3438  | 1106 | 3.85 | 3593  | 1147 | 4.15 | 3869  | 1189 | 4.37 | 4070  | 1221 | 4.51 | 4202  | 1252 | 4.73 | 4409 | 1270 | 5.00 | 4660 | 1317 | 5.36 | 4996 |      |      |      |
| 5400 | 968                      | 3.31 | 3083  | 1035 | 3.54 | 3298  | 1083 | 3.85 | 3587  | 1120 | 4.03 | 3753  | 1160 | 4.33 | 4032  | 1202 | 4.54 | 4231  | 1233 | 4.68 | 4363  | 1262 | 4.91 | 4580 | 1278 | 5.20 | 4848 | ---  | ---  | ---  | ---  |      |      |
| 5500 | 984                      | 3.48 | 3240  | 1052 | 3.71 | 3455  | 1098 | 4.01 | 3740  | 1135 | 4.20 | 3918  | 1174 | 4.51 | 4200  | 1215 | 4.72 | 4396  | 1244 | 4.86 | 4528  | 1273 | 5.10 | 4757 | 1286 | 5.41 | 5044 | ---  | ---  | ---  | ---  |      |      |
| 5600 | 1000                     | 3.65 | 3403  | 1069 | 3.88 | 3618  | 1113 | 4.18 | 3897  | 1149 | 4.39 | 4089  | 1188 | 4.69 | 4372  | 1228 | 4.90 | 4566  | 1256 | 5.04 | 4698  | 1283 | 5.30 | 4938 | ---  | ---  | ---  | ---  | ---  | ---  | ---  |      |      |
| 5700 | 1017                     | 3.83 | 3574  | 1085 | 4.06 | 3789  | 1128 | 4.35 | 4058  | 1164 | 4.58 | 4265  | 1201 | 4.86 | 4549  | 1241 | 5.08 | 4740  | 1267 | 5.23 | 4672  | 1293 | 5.50 | 5125 | ---  | ---  | ---  | ---  | ---  | ---  | ---  |      |      |
| 5800 | 1033                     | 4.02 | 3751  | 1102 | 4.25 | 3965  | 1143 | 4.53 | 4224  | 1178 | 4.77 | 4447  | 1215 | 5.07 | 4731  | 1254 | 5.28 | 4918  | 1279 | 5.42 | 5050  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |      |      |
| 5900 | 1050                     | 4.22 | 3936  | 1119 | 4.45 | 4149  | 1159 | 4.71 | 4393  | 1193 | 4.97 | 4635  | 1229 | 5.27 | 4917  | 1267 | 5.47 | 5101  | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |      |
| 6000 | 1066                     | 4.43 | 4127  | 1136 | 4.66 | 4341  | 1174 | 4.90 | 4567  | 1207 | 5.18 | 4828  | 1243 | 5.48 | 5108  | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |      |
| 6100 | 1082                     | 4.64 | 4326  | 1152 | 4.87 | 4539  | 1189 | 5.09 | 4745  | 1222 | 5.39 | 5027  | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 6200 | 1098                     | 4.86 | 4531  | 1169 | 5.09 | 4744  | 1204 | 5.29 | 4927  | 1236 | 5.61 | 5231  | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |

High Horsepower Option Required

TABLE 26: DH078 (6-1/2 TON) DOWN SHOT BLOWER PERFORMANCE

| CFM  | External Static Pressure |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |      |      |      |      |
|------|--------------------------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|------|------|------|------|
|      | 0.2                      |      | 0.4   |      | 0.6  |       | 0.8  |      | 1.0   |      | 1.2  |       | 1.4  |      | 1.6   |      |      |       |      |      |      |      |      |      |
|      | RPM                      | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts |      |      |      |      |      |      |
| 1800 | 770                      | 0.49 | 456   | 835  | 0.62 | 576   | 907  | 0.75 | 694   | 983  | 0.87 | 810   | 1058 | 0.99 | 920   | 1127 | 1.10 | 1024  | 1186 | 1.20 | 1120 | 1229 | 1.29 | 1206 |
| 1900 | 783                      | 0.54 | 505   | 848  | 0.67 | 625   | 920  | 0.80 | 743   | 996  | 0.92 | 859   | 1071 | 1.04 | 969   | 1140 | 1.15 | 1073  | 1199 | 1.25 | 1168 | 1242 | 1.35 | 1255 |
| 2000 | 798                      | 0.60 | 558   | 862  | 0.73 | 678   | 935  | 0.86 | 796   | 1011 | 0.98 | 911   | 1086 | 1.10 | 1022  | 1155 | 1.21 | 1125  | 1213 | 1.31 | 1221 | 1257 | 1.40 | 1307 |
| 2100 | 814                      | 0.66 | 614   | 878  | 0.79 | 734   | 951  | 0.91 | 853   | 1027 | 1.04 | 968   | 1102 | 1.16 | 1078  | 1171 | 1.27 | 1182  | 1229 | 1.37 | 1278 | 1273 | 1.46 | 1364 |
| 2200 | 831                      | 0.72 | 674   | 895  | 0.85 | 794   | 968  | 0.98 | 913   | 1044 | 1.10 | 1028  | 1119 | 1.22 | 1138  | 1188 | 1.33 | 1242  | 1247 | 1.44 | 1338 | 1290 | 1.53 | 1424 |
| 2300 | 850                      | 0.79 | 738   | 914  | 0.92 | 858   | 986  | 1.05 | 976   | 1062 | 1.17 | 1091  | 1137 | 1.29 | 1202  | 1206 | 1.40 | 1306  | 1265 | 1.50 | 1401 | 1308 | 1.60 | 1487 |
| 2400 | 869                      | 0.86 | 805   | 933  | 0.99 | 925   | 1005 | 1.12 | 1043  | 1081 | 1.24 | 1158  | 1156 | 1.36 | 1268  | 1225 | 1.47 | 1372  | 1284 | 1.57 | 1468 | 1328 | 1.67 | 1554 |
| 2500 | 889                      | 0.94 | 874   | 953  | 1.07 | 994   | 1025 | 1.19 | 1113  | 1101 | 1.32 | 1228  | 1176 | 1.44 | 1338  | 1245 | 1.55 | 1442  | 1304 | 1.65 | 1538 | 1412 | 1.85 | 1817 |
| 2600 | 909                      | 1.02 | 947   | 973  | 1.14 | 1067  | 1046 | 1.27 | 1186  | 1122 | 1.40 | 1301  | 1197 | 1.51 | 1411  | 1266 | 1.63 | 1515  | 1324 | 1.73 | 1611 | 1434 | 2.05 | 1913 |
| 2700 | 930                      | 1.10 | 1023  | 994  | 1.23 | 1143  | 1067 | 1.35 | 1261  | 1143 | 1.48 | 1377  | 1218 | 1.60 | 1487  | 1287 | 1.71 | 1591  | 1389 | 2.09 | 1946 | 1457 | 2.16 | 2015 |
| 2800 | 952                      | 1.18 | 1102  | 1016 | 1.31 | 1221  | 1088 | 1.44 | 1340  | 1164 | 1.56 | 1455  | 1239 | 1.68 | 1565  | 1394 | 1.80 | 1697  | 1414 | 2.20 | 2053 | 1482 | 2.28 | 2121 |
| 2900 | 974                      | 1.27 | 1183  | 1038 | 1.40 | 1303  | 1110 | 1.52 | 1421  | 1186 | 1.65 | 1536  | 1259 | 1.79 | 1649  | 1370 | 1.92 | 2068  | —    | —    | —    | —    | —    | —    |
| 3000 | 996                      | 1.36 | 1266  | 1060 | 1.49 | 1386  | 1133 | 1.61 | 1505  | 1254 | 1.76 | 1623  | 1328 | 1.91 | 1764  | 1404 | 2.04 | —     | —    | —    | —    | —    | —    | —    |
| 3100 | 1019                     | 1.45 | 1353  | 1083 | 1.58 | 1473  | 1155 | 1.71 | 1591  | 1281 | 1.89 | 1703  | 1371 | 2.03 | 1871  | 1453 | 2.19 | —     | —    | —    | —    | —    | —    | —    |
| 3200 | 1042                     | 1.55 | 1441  | 1106 | 1.67 | 1561  | 1237 | 1.85 | 1677  | 1327 | 2.00 | 1800  | 1421 | 2.15 | 1957  | 1481 | 2.31 | —     | —    | —    | —    | —    | —    | —    |
| 3300 | 1065                     | 1.64 | 1532  | 1129 | 1.76 | 1639  | 1266 | 1.96 | 1766  | 1366 | 2.12 | 1889  | 1461 | 2.26 | 2007  | 1511 | 2.43 | —     | —    | —    | —    | —    | —    | —    |
| 3400 | 1148                     | 2.04 | 1902  | 1223 | 2.24 | 2092  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    |
| 3500 | 1179                     | 2.19 | 2039  | 1254 | 2.39 | 2230  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    |

Light Horsepower Option Required

TABLE 27: DH090 (7-1/2 TON) DOWN SHOT BLOWER PERFORMANCE

| CFM  | External Static Pressure |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |      |      |      |      |      |      |      |      |
|------|--------------------------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|------|------|------|------|------|------|------|------|
|      | 0.2                      |       | 0.4  |       | 0.6  |       | 0.8  |       | 1.0  |       | 1.2  |       | 1.4  |       | 1.6  |       | 1.8  |       |      |      |      |      |      |      |      |      |      |
|      | RPM                      | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts | RPM  | Watts |      |      |      |      |      |      |      |      |      |
| 2000 | 814                      | 0.52  | 488  | 888   | 0.71 | 665   | 960  | 0.89  | 834  | 1030  | 1.06 | 984   | 1103 | 1.18  | 1104 | 1179  | 1.27 | 1185  | 1253 | 1.51 | 1411 | 1335 | 1.69 | 1577 | 1429 | 1.90 | 1773 |
| 2100 | 831                      | 0.60  | 558  | 905   | 0.79 | 735   | 977  | 0.97  | 904  | 1047  | 1.13 | 1054  | 1120 | 1.26  | 1174 | 1196  | 1.35 | 1255  | 1266 | 1.60 | 1492 | 1349 | 1.78 | 1658 | 1443 | 1.99 | 1854 |
| 2200 | 849                      | 0.68  | 633  | 924   | 0.87 | 810   | 995  | 1.05  | 979  | 1066  | 1.21 | 1129  | 1138 | 1.34  | 1249 | 1214  | 1.43 | 1330  | 1282 | 1.69 | 1574 | 1364 | 1.87 | 1741 | 1458 | 2.08 | 1936 |
| 2300 | 869                      | 0.77  | 713  | 943   | 0.95 | 890   | 1015 | 1.14  | 1059 | 1086  | 1.30 | 1208  | 1158 | 1.43  | 1329 | 1234  | 1.51 | 1410  | 1299 | 1.78 | 1658 | 1381 | 1.96 | 1824 | 1475 | 2.17 | 2020 |
| 2400 | 890                      | 0.86  | 798  | 964   | 1.05 | 975   | 1036 | 1.23  | 1143 | 1106  | 1.39 | 1293  | 1179 | 1.52  | 1414 | 1255  | 1.60 | 1495  | 1317 | 1.87 | 1745 | 1400 | 2.05 | 1911 | 1493 | 2.26 | 2107 |
| 2500 | 911                      | 0.95  | 887  | 986   | 1.14 | 1063  | 1057 | 1.32  | 1232 | 1128  | 1.48 | 1382  | 1201 | 1.61  | 1503 | 1277  | 1.70 | 1584  | 1337 | 1.97 | 1834 | 1420 | 2.15 | 2000 | 1513 | 2.36 | 2196 |
| 2600 | 934                      | 1.05  | 980  | 1009  | 1.24 | 1157  | 1080 | 1.42  | 1325 | 1151  | 1.58 | 1475  | 1223 | 1.71  | 1596 | 1299  | 1.80 | 1677  | 1358 | 2.07 | 1928 | 1440 | 2.25 | 2094 | 1534 | 2.46 | 2290 |
| 2700 | 958                      | 1.16  | 1077 | 1032  | 1.35 | 1254  | 1104 | 1.53  | 1422 | 1175  | 1.69 | 1572  | 1247 | 1.82  | 1693 | 1323  | 1.90 | 1774  | 1379 | 2.17 | 2026 | 1462 | 2.35 | 2182 | 1556 | 2.56 | 2388 |
| 2800 | 982                      | 1.26  | 1178 | 1057  | 1.45 | 1355  | 1128 | 1.63  | 1524 | 1199  | 1.80 | 1674  | 1271 | 1.92  | 1794 | 1348  | 2.01 | 1875  | 1402 | 2.28 | 2128 | 1485 | 2.46 | 2294 | 1578 | 2.67 | 2490 |
| 2900 | 1007                     | 1.38  | 1283 | 1082  | 1.57 | 1460  | 1153 | 1.75  | 1629 | 1224  | 1.91 | 1779  | 1297 | 2.04  | 1899 | 1373  | 2.12 | 1980  | 1425 | 2.40 | 2236 | 1508 | 2.58 | 2402 | 1602 | 2.79 | 2598 |
| 3000 | 1033                     | 1.49  | 1392 | 1108  | 1.68 | 1569  | 1179 | 1.86  | 1737 | 1250  | 2.02 | 1887  | 1322 | 2.15  | 2008 | 1399  | 2.24 | 2089  | 1450 | 2.52 | 2348 | 1532 | 2.70 | 2515 | 1626 | 2.91 | 2710 |
| 3100 | 1060                     | 1.61  | 1504 | 1134  | 1.80 | 1681  | 1206 | 1.98  | 1850 | 1277  | 2.15 | 1999  | 1349 | 2.27  | 2120 | 1400  | 2.39 | 2219  | 1474 | 2.65 | 2467 | 1557 | 2.82 | 2633 | 1651 | 3.03 | 2829 |
| 3200 | 1087                     | 1.74  | 1620 | 1162  | 1.93 | 1797  | 1233 | 2.11  | 1965 | 1304  | 2.27 | 2115  | 1357 | 2.47  | 2203 | 1426  | 2.62 | 2313  | 1500 | 2.78 | 2590 | 1583 | 2.96 | 2768 | 1676 | 3.17 | 2952 |
| 3300 | 1115                     | 1.87  | 1739 | 1189  | 2.06 | 1916  | 1261 | 2.24  | 2084 | 1318  | 2.49 | 2291  | 1383 | 2.61  | 2339 | 1457  | 2.76 | 2473  | 1526 | 2.92 | 2719 | 1608 | 3.10 | 2886 | 1702 | 3.31 | 3081 |
| 3400 | 1143                     | 2.00  | 1861 | 1218  | 2.19 | 2038  | 1279 | 2.44  | 2207 | 1344  | 2.69 | 2466  | 1409 | 2.75  | 2558 | 1476  | 2.90 | 2707  | 1552 | 3.06 | 2854 | 1635 | 3.24 | 3021 | 1729 | 3.45 | 3216 |
| 3500 | 1172                     | 2.13  | 1986 | 1246  | 2.32 | 2163  | 1306 | 2.59  | 2411 | 1371  | 2.75 | 2566  | 1436 | 2.91  | 2708 | 1505  | 3.06 | 2848  | 1579 | 3.21 | 2995 | 1662 | 3.39 | 3161 | ---  | ---  | ---  |
| 3600 | 1201                     | 2.27  | 2114 | 1267  | 2.55 | 2377  | 1334 | 2.74  | 2557 | 1398  | 2.91 | 2713  | 1464 | 3.06  | 2855 | 1532  | 3.21 | 2994  | 1606 | 3.37 | 3142 | ---  | ---  | ---  | ---  | ---  | ---  |
| 3700 | 1223                     | 2.48  | 2314 | 1295  | 2.71 | 2530  | 1361 | 2.91  | 2710 | 1426  | 3.07 | 2865  | 1491 | 3.23  | 3007 | 1560  | 3.38 | 3174  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 3800 | 1254                     | 2.65  | 2473 | 1323  | 2.98 | 2688  | 1389 | 3.08  | 2868 | 1454  | 3.24 | 3023  | 1519 | 3.40  | 3165 | ---   | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 3900 | 1280                     | 2.93  | 2636 | 1351  | 3.06 | 2852  | 1418 | 3.25  | 3032 | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4000 | 1308                     | 3.01  | 2806 | 1380  | 3.24 | 3021  | 1446 | 3.43  | 3201 | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |

High Horsepower Option Required

**TABLE 28: DH102 (8-1/2 TON) DOWN SHOT BLOWER PERFORMANCE**

| CFM  | External Static Pressure |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |      |      |      |      |      |      |      |
|------|--------------------------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|------|------|------|------|------|------|------|
|      | 0.2                      |      | 0.4   |      | 0.6  |       | 0.8  |      | 1.0   |      | 1.2  |       | 1.4  |      | 1.6   |      | 1.8  |       |      |      |      |      |      |      |      |      |      |
|      | RPM                      | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts |      |      |      |      |      |      |      |      |      |
| 2000 | 842                      | 0.46 | 431   | 913  | 0.69 | 647   | 980  | 0.89 | 827   | 1044 | 1.05 | 982   | 1110 | 1.21 | 1124  | 1178 | 1.36 | 1263  | 1253 | 1.51 | 1411 | 1335 | 1.69 | 1577 | 1428 | 1.90 | 1773 |
| 2100 | 856                      | 0.55 | 513   | 927  | 0.78 | 728   | 993  | 0.97 | 908   | 1058 | 1.14 | 1064  | 1123 | 1.29 | 1206  | 1192 | 1.44 | 1345  | 1345 | 1.60 | 1492 | 1349 | 1.78 | 1658 | 1443 | 1.99 | 1854 |
| 2200 | 871                      | 0.64 | 595   | 942  | 0.87 | 810   | 1009 | 1.06 | 990   | 1074 | 1.23 | 1146  | 1139 | 1.38 | 1288  | 1207 | 1.53 | 1427  | 1282 | 1.69 | 1574 | 1364 | 1.87 | 1741 | 1498 | 2.08 | 1936 |
| 2300 | 888                      | 0.73 | 679   | 959  | 0.96 | 894   | 1026 | 1.15 | 1074  | 1091 | 1.32 | 1230  | 1156 | 1.47 | 1372  | 1224 | 1.62 | 1511  | 1299 | 1.78 | 1658 | 1381 | 1.96 | 1824 | 1476 | 2.17 | 2020 |
| 2400 | 906                      | 0.82 | 765   | 978  | 1.05 | 980   | 1044 | 1.24 | 1160  | 1044 | 1.41 | 1316  | 1174 | 1.56 | 1458  | 1243 | 1.71 | 1597  | 1317 | 1.87 | 1745 | 1400 | 2.05 | 1911 | 1493 | 2.26 | 2107 |
| 2500 | 926                      | 0.92 | 855   | 997  | 1.15 | 1070  | 1064 | 1.34 | 1250  | 1129 | 1.51 | 1406  | 1194 | 1.66 | 1548  | 1262 | 1.81 | 1667  | 1340 | 2.02 | 1883 | 1415 | 2.13 | 1990 | 1494 | 2.21 | 2063 |
| 2600 | 947                      | 1.02 | 948   | 1018 | 1.25 | 1164  | 1085 | 1.44 | 1344  | 1149 | 1.61 | 1499  | 1215 | 1.76 | 1641  | 1283 | 1.91 | 1780  | 1362 | 2.13 | 1990 | 1436 | 2.25 | 2096 | 1515 | 2.33 | 2170 |
| 2700 | 969                      | 1.12 | 1046  | 1040 | 1.35 | 1261  | 1106 | 1.55 | 1441  | 1171 | 1.71 | 1597  | 1236 | 1.87 | 1739  | 1305 | 2.02 | 1878  | 1384 | 2.26 | 2102 | 1459 | 2.37 | 2209 | 1538 | 2.45 | 2282 |
| 2800 | 991                      | 1.23 | 1149  | 1062 | 1.46 | 1364  | 1129 | 1.66 | 1544  | 1194 | 1.82 | 1700  | 1259 | 1.98 | 1842  | 1328 | 2.13 | 1981  | 1408 | 2.38 | 2221 | 1483 | 2.50 | 2328 | 1562 | 2.58 | 2401 |
| 2900 | 1015                     | 1.35 | 1256  | 1086 | 1.58 | 1471  | 1152 | 1.77 | 1651  | 1201 | 1.94 | 1807  | 1283 | 2.09 | 1949  | 1362 | 2.37 | 2207  | 1434 | 2.52 | 2346 | 1508 | 2.63 | 2452 | 1587 | 2.74 | 2526 |
| 3000 | 1039                     | 1.47 | 1369  | 1110 | 1.70 | 1584  | 1177 | 1.89 | 1764  | 1241 | 2.06 | 1920  | 1307 | 2.21 | 2062  | 1388 | 2.51 | 2338  | 1460 | 2.66 | 2477 | 1534 | 2.77 | 2583 | 1613 | 2.85 | 2657 |
| 3100 | 1064                     | 1.60 | 1487  | 1135 | 1.83 | 1702  | 1201 | 2.02 | 1882  | 1266 | 2.19 | 2038  | 1345 | 2.47 | 2207  | 1415 | 2.66 | 2475  | 1497 | 2.80 | 2614 | 1561 | 2.92 | 2721 | 1641 | 3.00 | 2794 |
| 3200 | 1089                     | 1.73 | 1611  | 1160 | 1.96 | 1826  | 1227 | 2.15 | 2006  | 1282 | 2.32 | 2161  | 1373 | 2.69 | 2450  | 1443 | 2.81 | 2619  | 1515 | 2.96 | 2757 | 1590 | 3.07 | 2864 | 1669 | 3.15 | 2937 |
| 3300 | 1115                     | 1.87 | 1740  | 1186 | 2.10 | 1955  | 1253 | 2.29 | 2135  | 1318 | 2.46 | 2291  | 1402 | 2.79 | 2600  | 1472 | 2.97 | 2768  | 1544 | 3.12 | 2907 | 1619 | 3.23 | 3013 | 1688 | 3.31 | 3087 |
| 3400 | 1142                     | 2.01 | 1875  | 1213 | 2.24 | 2080  | 1279 | 2.44 | 2270  | 1361 | 2.74 | 2558  | 1432 | 2.96 | 2755  | 1502 | 3.14 | 2924  | 1574 | 3.29 | 3062 | 1648 | 3.40 | 3169 | —    | —    | —    |
| 3500 | 1168                     | 2.16 | 2016  | 1240 | 2.39 | 2231  | 1306 | 2.59 | 2411  | 1392 | 2.92 | 2720  | 1492 | 3.13 | 2917  | 1533 | 3.31 | 3086  | —    | —    | —    | —    | —    | —    | —    | —    | —    |
| 3600 | 1196                     | 2.32 | 2162  | 1267 | 2.55 | 2377  | 1353 | 2.86 | 2663  | 1423 | 3.10 | 2887  | 1494 | 3.31 | 3085  | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    |
| 3700 | 1223                     | 2.48 | 2314  | 1295 | 2.71 | 2530  | 1383 | 3.04 | 2837  | 1455 | 3.28 | 3061  | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    |
| 3800 | 1251                     | 2.65 | 2473  | 1341 | 2.97 | 2767  | 1416 | 3.24 | 3016  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    |
| 3900 | 1280                     | 2.83 | 2636  | 1374 | 3.17 | 2952  | 1450 | 3.43 | 3202  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    |
| 4000 | 1328                     | 3.08 | 2870  | 1408 | 3.37 | 3143  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    |
| 4100 | 1383                     | 3.29 | 3067  | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —     | —    | —    | —    | —    | —    | —    | —    | —    | —    |

Optional Drive Required

**TABLE 29: DH120 (10 TON) DOWN SHOT BLOWER PERFORMANCE**

| CFM  | External Static Pressure |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |       |      |      |      |      |      |      |      |
|------|--------------------------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|------|------|------|------|------|
|      | 0.2                      |       | 0.4  |      | 0.6   |      | 0.8  |       | 1.0  |      | 1.2   |      | 1.4  |       | 1.6  |      |       |      |      |      |      |      |      |      |
|      | RPM                      | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts | RPM  | BHP  | Watts |      |      |      |      |      |      |      |
| 3000 | ---                      | ---   | 741  | 1.21 | 1128  | 814  | 1.34 | 1248  | 880  | 1.50 | 1400  | 935  | 1.68 | 1564  | 981  | 1.86 | 1732  | 1018 | 2.03 | 1893 | 1047 | 2.17 | 2026 |      |
| 3100 | ---                      | ---   | 758  | 1.26 | 1178  | 829  | 1.41 | 1312  | 892  | 1.58 | 1473  | 945  | 1.76 | 1643  | 990  | 1.95 | 1815  | 1025 | 2.12 | 1976 | 1053 | 2.26 | 2107 |      |
| 3200 | ---                      | ---   | 775  | 1.32 | 1234  | 843  | 1.48 | 1381  | 904  | 1.66 | 1550  | 956  | 1.85 | 1726  | 998  | 2.04 | 1900  | 1032 | 2.21 | 2061 | 1060 | 2.35 | 2190 |      |
| 3300 | ---                      | ---   | 792  | 1.39 | 1298  | 858  | 1.56 | 1456  | 916  | 1.75 | 1632  | 966  | 1.94 | 1812  | 1007 | 2.13 | 1989  | 1040 | 2.31 | 2149 | 1066 | 2.44 | 2276 |      |
| 3400 | 748                      | 1.34  | 1248 | 809  | 1.47  | 1369 | 872  | 1.65  | 1537 | 929  | 1.84  | 1719 | 976  | 2.04  | 1902 | 1015 | 2.23  | 2080 | 1047 | 2.40 | 2239 | 1072 | 2.53 | 2361 |
| 3500 | 767                      | 1.41  | 1315 | 826  | 1.55  | 1447 | 887  | 1.74  | 1623 | 941  | 1.94  | 1810 | 986  | 2.14  | 1995 | 1024 | 2.33  | 2174 | 1054 | 2.50 | 2331 | ---  | ---  | ---  |
| 3600 | 786                      | 1.49  | 1391 | 843  | 1.64  | 1532 | 901  | 1.84  | 1715 | 953  | 2.04  | 1905 | 997  | 2.24  | 2092 | 1033 | 2.44  | 2270 | 1062 | 2.60 | 2425 | ---  | ---  | ---  |
| 3700 | 805                      | 1.58  | 1474 | 860  | 1.74  | 1624 | 916  | 1.94  | 1812 | 965  | 2.15  | 2005 | 1007 | 2.35  | 2193 | 1041 | 2.54  | 2370 | 1069 | 2.71 | 2522 | ---  | ---  | ---  |
| 3800 | 824                      | 1.68  | 1566 | 877  | 1.85  | 1723 | 930  | 2.05  | 1915 | 977  | 2.26  | 2109 | 1017 | 2.46  | 2297 | 1050 | 2.65  | 2473 | 1076 | 2.81 | 2621 | ---  | ---  | ---  |
| 3900 | 843                      | 1.79  | 1666 | 894  | 1.96  | 1829 | 945  | 2.17  | 2023 | 990  | 2.38  | 2216 | 1027 | 2.58  | 2405 | 1059 | 2.77  | 2570 | ---  | ---  | ---  | ---  | ---  | ---  |
| 4000 | 862                      | 1.90  | 1774 | 911  | 2.08  | 1943 | 959  | 2.29  | 2138 | 1002 | 2.50  | 2331 | 1038 | 2.70  | 2516 | 1067 | 2.88  | 2688 | ---  | ---  | ---  | ---  | ---  | ---  |
| 4100 | 881                      | 2.03  | 1890 | 928  | 2.21  | 2063 | 974  | 2.42  | 2257 | 1014 | 2.63  | 2449 | 1048 | 2.82  | 2631 | 1076 | 3.00  | 2797 | ---  | ---  | ---  | ---  | ---  | ---  |
| 4200 | 900                      | 2.16  | 2015 | 945  | 2.35  | 2190 | 988  | 2.56  | 2383 | 1026 | 2.76  | 2574 | 1058 | 2.95  | 2749 | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4300 | 919                      | 2.30  | 2148 | 962  | 2.49  | 2324 | 1003 | 2.70  | 2514 | 1038 | 2.89  | 2697 | 1068 | 3.08  | 2871 | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4400 | 938                      | 2.45  | 2286 | 979  | 2.65  | 2468 | 1017 | 2.84  | 2650 | 1050 | 3.03  | 2828 | 1079 | 3.21  | 2996 | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4500 | 957                      | 2.61  | 2437 | 996  | 2.80  | 2614 | 1032 | 3.00  | 2792 | 1063 | 3.18  | 2963 | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4600 | 976                      | 2.78  | 2595 | 1013 | 2.97  | 2770 | 1046 | 3.16  | 2940 | 1075 | 3.33  | 3103 | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4700 | 995                      | 2.96  | 2760 | 1030 | 3.15  | 2932 | 1061 | 3.32  | 3094 | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4800 | 1015                     | 3.15  | 2934 | 1047 | 3.33  | 3102 | 1075 | 3.49  | 3253 | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 4900 | 1034                     | 3.34  | 3115 | 1065 | 3.52  | 3278 | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 5000 | 1053                     | 3.55  | 3305 | 1082 | 3.71  | 3462 | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---   | ---  | ---  | ---  | ---  | ---  | ---  | ---  |

High Horsepower Option Required

Motor Efficiency 0.8

Std HP Motor2





**TABLE 31: ADDITIONAL STATIC RESISTANCE DH120 AND 150**

| CFM  | Cooling Only <sup>1</sup> | Economizer <sup>2 3</sup> | Electric Heat KW <sup>2</sup> |      |      |      |      |
|------|---------------------------|---------------------------|-------------------------------|------|------|------|------|
|      |                           |                           | 9                             | 18   | 24   | 36   | 54   |
| 1900 | 0.06                      | 0.02                      | 0.05                          | 0.06 | 0.07 | 0.08 | 0.10 |
| 2100 | 0.07                      | 0.02                      | 0.06                          | 0.07 | 0.08 | 0.09 | 0.11 |
| 2300 | 0.08                      | 0.02                      | 0.07                          | 0.08 | 0.09 | 0.10 | 0.13 |
| 2500 | 0.09                      | 0.02                      | 0.08                          | 0.09 | 0.10 | 0.11 | 0.14 |
| 2700 | 0.11                      | 0.03                      | 0.09                          | 0.10 | 0.12 | 0.13 | 0.16 |
| 2900 | 0.12                      | 0.03                      | 0.10                          | 0.11 | 0.13 | 0.14 | 0.18 |
| 3100 | 0.14                      | 0.03                      | 0.12                          | 0.13 | 0.15 | 0.16 | 0.20 |
| 3300 | 0.16                      | 0.03                      | 0.13                          | 0.14 | 0.17 | 0.18 | 0.22 |
| 3500 | 0.18                      | 0.04                      | 0.15                          | 0.16 | 0.19 | 0.20 | 0.24 |
| 3700 | 0.20                      | 0.04                      | 0.17                          | 0.18 | 0.21 | 0.22 | 0.26 |
| 3900 | 0.23                      | 0.04                      | 0.19                          | 0.20 | 0.23 | 0.24 | 0.28 |
| 4100 | 0.25                      | 0.04                      | 0.21                          | 0.22 | 0.25 | 0.26 | 0.31 |
| 4300 | 0.28                      | 0.05                      | 0.23                          | 0.24 | 0.28 | 0.29 | 0.34 |
| 4500 | 0.30                      | 0.05                      | 0.25                          | 0.26 | 0.30 | 0.31 | 0.37 |
| 4700 | 0.33                      | 0.05                      | 0.28                          | 0.29 | 0.33 | 0.34 | 0.40 |
| 4900 | 0.36                      | 0.05                      | 0.30                          | 0.31 | 0.35 | 0.37 | 0.43 |
| 5100 | 0.39                      | 0.06                      | 0.33                          | 0.34 | 0.38 | 0.40 | 0.46 |
| 5300 | 0.42                      | 0.06                      | 0.35                          | 0.37 | 0.41 | 0.43 | 0.49 |
| 5500 | 0.45                      | 0.06                      | 0.38                          | 0.40 | 0.44 | 0.46 | 0.53 |
| 5700 | 0.48                      | 0.06                      | 0.41                          | 0.43 | 0.47 | 0.49 | 0.56 |
| 5900 | 0.52                      | 0.07                      | 0.44                          | 0.46 | 0.50 | 0.53 | 0.59 |
| 6100 | 0.56                      | 0.07                      | 0.47                          | 0.49 | 0.53 | 0.56 | 0.62 |
| 6300 | 0.60                      | 0.07                      | 0.50                          | 0.53 | 0.56 | 0.59 | 0.65 |

- 1 Add these resistance values to the available static resistance in the respective Blower Performance Tables.
- 2 Deduct these resistance values from the available external static pressure shown in the respective Blower Performance Table.
- 3 The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct system is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

**TABLE 32: ADDITIONAL STATIC RESISTANCE DH078, 090, 102**

| CFM  | Cooling Only <sup>1</sup> | Economizer <sup>2 3</sup> | Electric Heat KW <sup>2</sup> |      |      |      |      |
|------|---------------------------|---------------------------|-------------------------------|------|------|------|------|
|      |                           |                           | 9                             | 18   | 24   | 36   | 54   |
| 1900 | -0.004                    | 0.07                      | 0.05                          | 0.06 | 0.07 | 0.08 | 0.10 |
| 2100 | 0.01                      | 0.09                      | 0.06                          | 0.07 | 0.08 | 0.09 | 0.11 |
| 2300 | 0.01                      | 0.11                      | 0.07                          | 0.08 | 0.09 | 0.10 | 0.13 |
| 2500 | 0.02                      | 0.13                      | 0.08                          | 0.09 | 0.10 | 0.11 | 0.14 |
| 2700 | 0.03                      | 0.16                      | 0.09                          | 0.10 | 0.12 | 0.13 | 0.16 |
| 2900 | 0.04                      | 0.18                      | 0.10                          | 0.11 | 0.13 | 0.14 | 0.18 |
| 3100 | 0.05                      | 0.20                      | 0.12                          | 0.13 | 0.15 | 0.16 | 0.20 |
| 3300 | 0.06                      | 0.22                      | 0.13                          | 0.14 | 0.17 | 0.18 | 0.22 |
| 3500 | 0.07                      | 0.24                      | 0.15                          | 0.16 | 0.19 | 0.20 | 0.24 |
| 3700 | 0.08                      | 0.27                      | 0.17                          | 0.18 | 0.21 | 0.22 | 0.26 |
| 3900 | 0.09                      | 0.29                      | 0.19                          | 0.20 | 0.23 | 0.24 | 0.28 |
| 4100 | 0.09                      | 0.31                      | 0.21                          | 0.22 | 0.25 | 0.26 | 0.31 |
| 4300 | 0.10                      | 0.33                      | 0.23                          | 0.24 | 0.28 | 0.29 | 0.34 |

- 1 Deduct these resistance values to the available static resistance in the respective Blower Performance Tables.
- 2 Deduct these resistance values from the available external static pressure shown in the respective Blower Performance Table.
- 3 The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct system is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

**TABLE 33: ELECTRIC HEAT MINIMUM SUPPLY AIR CFM**

| HEATER |         | UNIT MODEL SIZE (NOMINAL TONS) |           |           |          |            |
|--------|---------|--------------------------------|-----------|-----------|----------|------------|
| kW     | VOLTAGE | 078 (6.5)                      | 090 (7.5) | 102 (8.5) | 120 (10) | 150 (12.5) |
|        |         | MINIMUM SUPPLY AIR CFM         |           |           |          |            |
| 9      | 208/230 | 1950                           | 2250      | 2550      | -        | -          |
| 18     |         | 1950                           | 2250      | 2550      | 3000     | 3750       |
| 24     |         | 1950                           | 2250      | 2550      | 3000     | 3750       |
| 36     |         | 1950                           | 2250      | 2550      | 3000     | 3750       |
| 54     |         | -                              | -         | -         | 3500     | 4000       |
| 9      | 480     | 1950                           | 2250      | 2550      | -        | -          |
| 18     |         | 1950                           | 2250      | 2550      | 3000     | 3750       |
| 24     |         | 1950                           | 2250      | 2550      | 3000     | 3750       |
| 36     |         | 1950                           | 2250      | 2550      | 3000     | 3750       |
| 54     |         | -                              | -         | -         | 3000     | 3750       |
| 9      | 600     | 1950                           | 2250      | 2550      | -        | -          |
| 18     |         | 1950                           | 2250      | 2550      | 3000     | 3750       |
| 24     |         | 1950                           | 2250      | 2550      | 3000     | 3750       |
| 36     |         | 1950                           | 2250      | 2550      | 3000     | 3750       |
| 54     |         | -                              | -         | -         | 3500     | 3750       |

**TABLE 34: INDOOR BLOWER SPECIFICATIONS**

| MODEL | MOTOR |      |      |      |       | MOTOR SHEAVE     |            |       | BLOWER SHEAVE    |            |       | BELT |
|-------|-------|------|------|------|-------|------------------|------------|-------|------------------|------------|-------|------|
|       | HP    | RPM  | Eff. | SF   | Frame | Datum Dia. (in.) | Bore (in.) | Model | Datum Dia. (in.) | Bore (in.) | Model |      |
| DH078 | 1-1/2 | 1725 | 80%  | 1.15 | 56    | 3.4 - 4.4        | 7/8        | 1VM50 | 7.0              | 1          | AK74  | A49  |
|       | 2     | 1725 | 80%  | 1.15 | 56    | 3.4 - 4.4        | 7/8        | 1VM50 | 6.2              | 1          | AK66  | A49  |
| DH090 | 2     | 1725 | 80%  | 1.15 | 56    | 3.4 - 4.4        | 7/8        | 1VM50 | 6.5              | 1          | AK69  | A49  |
|       | 3     | 1725 | 80%  | 1.15 | 56    | 3.4 - 4.4        | 7/8        | 1VM50 | 6.0              | 1          | AK64  | A49  |
| DH102 | 3     | 1725 | 80%  | 1.15 | 56    | 3.4 - 4.4        | 7/8        | 1VM50 | 6.0              | 1          | AK64  | A49  |
|       | 3     | 1725 | 80%  | 1.15 | 56    | 3.4 - 4.4        | 7/8        | 1VM50 | 5.7              | 1          | AK61  | A49  |
| DH120 | 2     | 1725 | 80%  | 1.15 | 56    | 3.4 - 4.4        | 7/8        | 1VM50 | 8.5              | 1          | AK89  | A56  |
|       | 3     | 1725 | 80%  | 1.15 | 56    | 3.4 - 4.4        | 7/8        | 1VM50 | 7.0              | 1          | AK74  | A54  |
| DH150 | 3     | 1725 | 80%  | 1.15 | 56    | 3.4 - 4.4        | 7/8        | 1VM50 | 7.0              | 1          | AK74  | A54  |
|       | 5     | 1725 | 87%  | 1.15 | 184T  | 4.3 - 5.3        | 1 1/8      | 1VP56 | 6.7              | 1          | BK77  | BX55 |

**TABLE 35: POWER EXHAUST SPECIFICATIONS**

| POWER EXHAUST MODEL | VOLT    | PHASE | MOTOR |                  |     | ELECTRICAL |     |     | FUZE SIZE | CFM@ 0.1 ESP |
|---------------------|---------|-------|-------|------------------|-----|------------|-----|-----|-----------|--------------|
|                     |         |       | HP    | RPM <sup>1</sup> | QTY | LRA        | FLA | MCA |           |              |
| 2PE0473225          | 208/230 | 1     | 0.75  | 1075             | 1   | 24.9       | 5.0 | 6.3 | 10        | 3,800        |
| 2PE0473246          | 460     | 1     |       |                  |     | -          | 2.2 | 2.8 | 5         |              |
| 2PE0473258          | 575     | 1     |       |                  |     | 1.5        | 1.9 | 4   |           |              |

1 Motors are multi-tapped and factory wired for high speed.

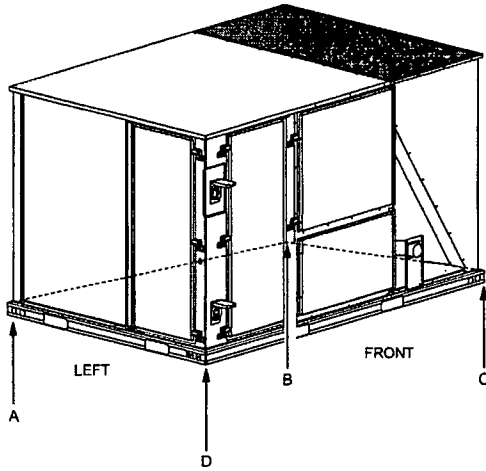


FIGURE 2 - UNIT 4 POINT LOAD

TABLE 36: 4 POINT LOAD WEIGHT

| Model | Location (lbs.) |     |     |     |
|-------|-----------------|-----|-----|-----|
|       | A               | B   | C   | D   |
| DH078 | 197             | 147 | 230 | 309 |
| DH090 | 199             | 148 | 232 | 311 |
| DH102 | 201             | 150 | 234 | 315 |
| DH120 | 265             | 226 | 330 | 386 |
| DH150 | 263             | 224 | 327 | 383 |

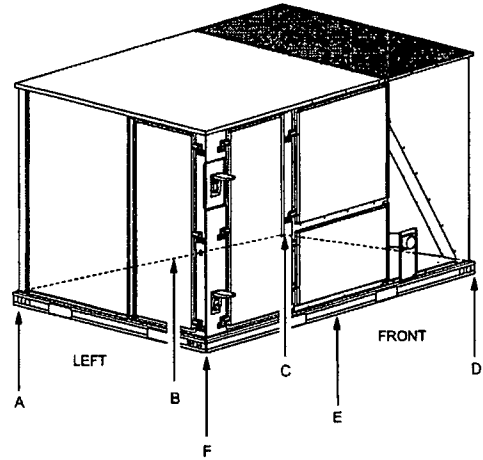
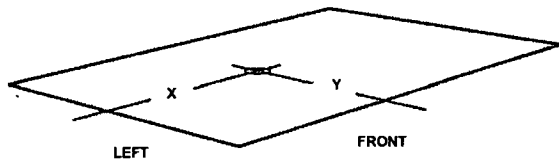


FIGURE 4 - UNIT 6 POINT LOAD

TABLE 37: 6 POINT LOAD WEIGHT

| Model | Locations (lbs.) |     |     |     |     |     |
|-------|------------------|-----|-----|-----|-----|-----|
|       | A                | B   | C   | D   | E   | F   |
| DH078 | 138              | 113 | 93  | 146 | 176 | 216 |
| DH090 | 139              | 113 | 94  | 147 | 178 | 218 |
| DH102 | 141              | 115 | 95  | 149 | 180 | 221 |
| DH120 | 181              | 163 | 147 | 214 | 237 | 264 |
| DH150 | 180              | 161 | 146 | 213 | 235 | 262 |



| Unit Model Number | X      | Y      |
|-------------------|--------|--------|
| DH078             | 38     | 23     |
| DH090             | 38     | 23     |
| DH102             | 38     | 23     |
| DH120             | 47 1/2 | 25 1/2 |
| DH150             | 47 1/2 | 25 1/2 |

FIGURE 3 - UNIT CENTER OF GRAVITY

TABLE 38: UNIT WEIGHT

| Model                      | Shipping Weight (lbs.) | Operating Weight (lbs.) |
|----------------------------|------------------------|-------------------------|
| DH078                      | 888                    | 883                     |
| DH090                      | 895                    | 890                     |
| DH102                      | 905                    | 900                     |
| DH120                      | 1212                   | 1207                    |
| DH150                      | 1202                   | 1197                    |
| W/ECON.                    | 85                     | 84                      |
| W/PE                       | 150                    | 148                     |
| W/ELECT. HEAT <sup>1</sup> | 49                     | 49                      |
| W/GAS HEAT <sup>2</sup>    | 110                    | 110                     |

- 1 54 KW Heater
- 2 8 Tube Heat Exchanger

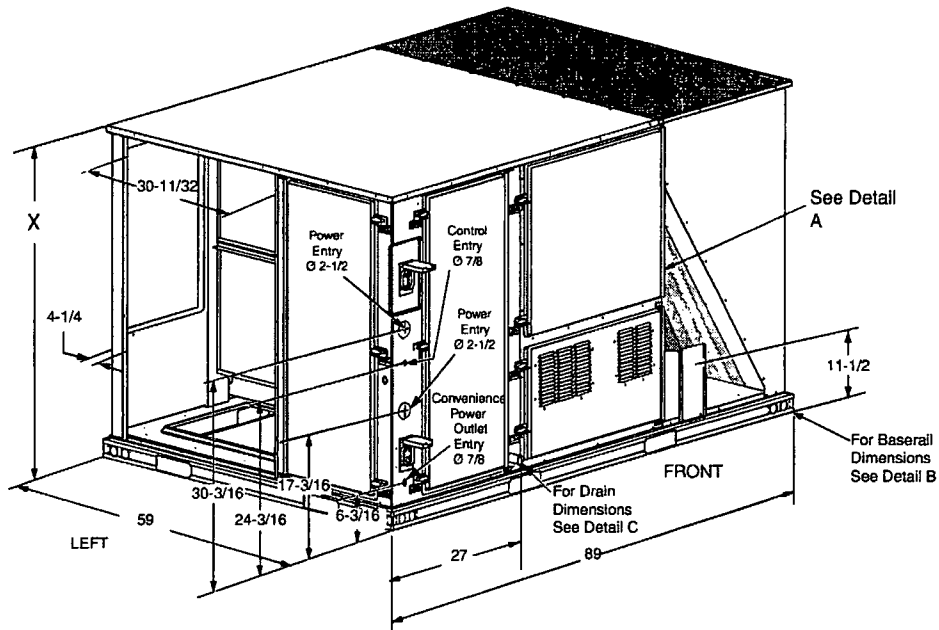
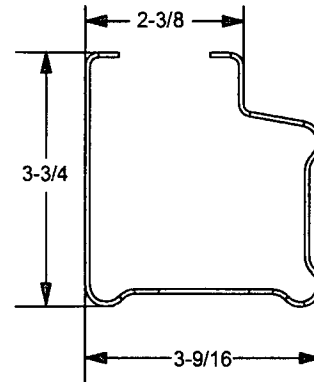


FIGURE 5 - UNIT DIMENSIONS

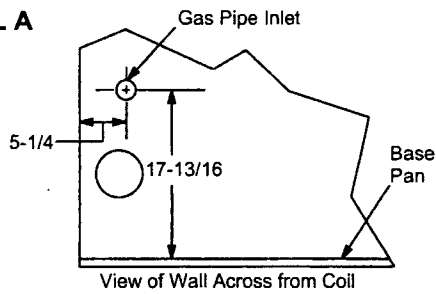
TABLE 39: UNIT HEIGHT

| Unit Model Number | X      |
|-------------------|--------|
| DH078             | 42     |
| DH090             | 42     |
| DH102             | 42     |
| DH120             | 50 3/4 |
| DH150             | 50 3/4 |

DETAIL B



DETAIL A



DETAIL C

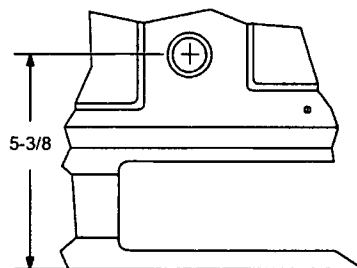
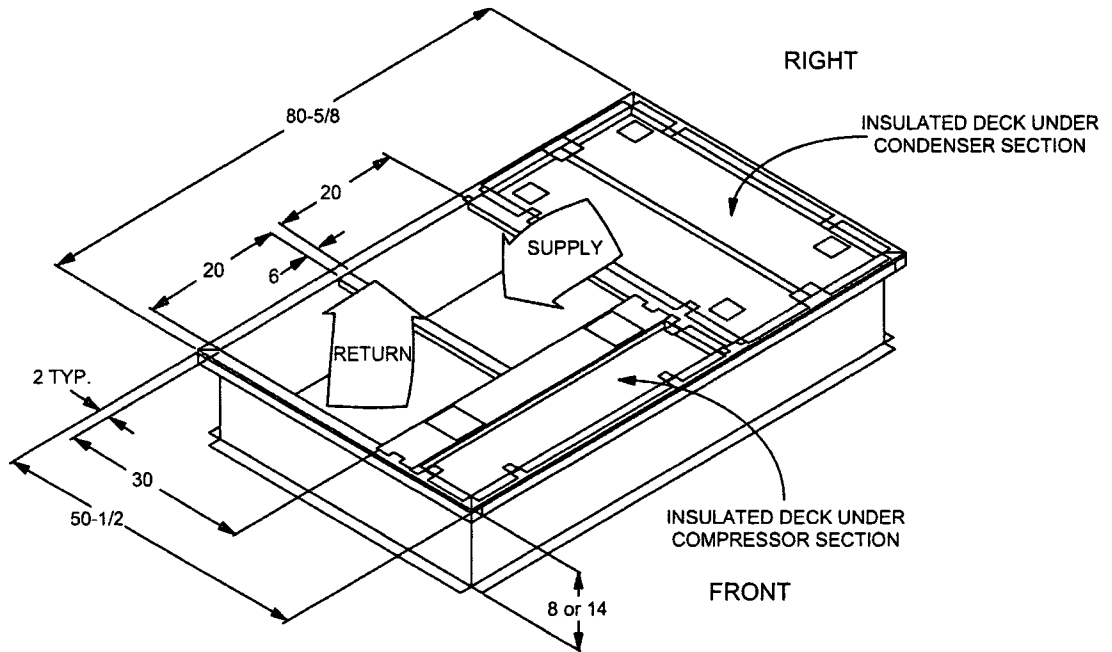


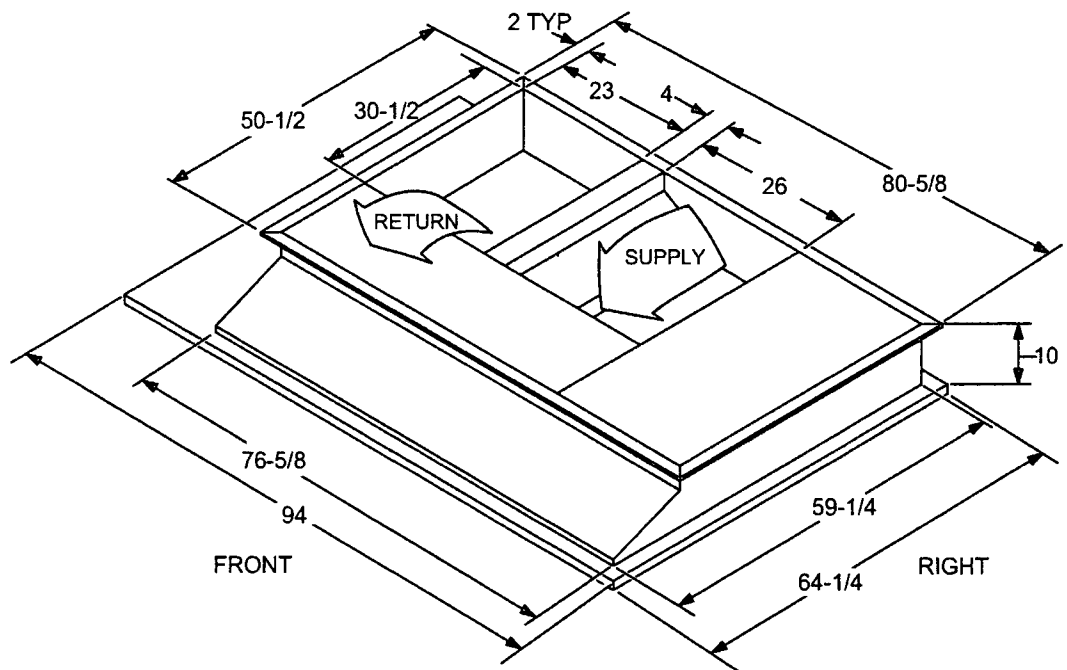
TABLE 40: UNIT CLEARANCES

| Top <sup>1</sup>  | 72" | Right               | 12" |
|-------------------|-----|---------------------|-----|
| Front             | 36" | Left                | 36" |
| Rear <sup>2</sup> | 36" | Bottom <sup>3</sup> | 0"  |

- Units must be installed outdoors. Overhanging structure or shrubs should not obstruct condenser air discharge outlet.
- To remove the slide-out drain pan, a rear clearance of 60" is required. If space is unavailable, the drain pan can be removed through the front by separating the corner wall.
- Units may be installed on combustible floors made from wood or class A, B or C roof covering materials.



**FIGURE 6 - PREDATOR® ROOF CURB DIMENSIONS**



**FIGURE 7 - SUNLINE™ TO PREDATOR® TRANSITION ROOF CURBS**

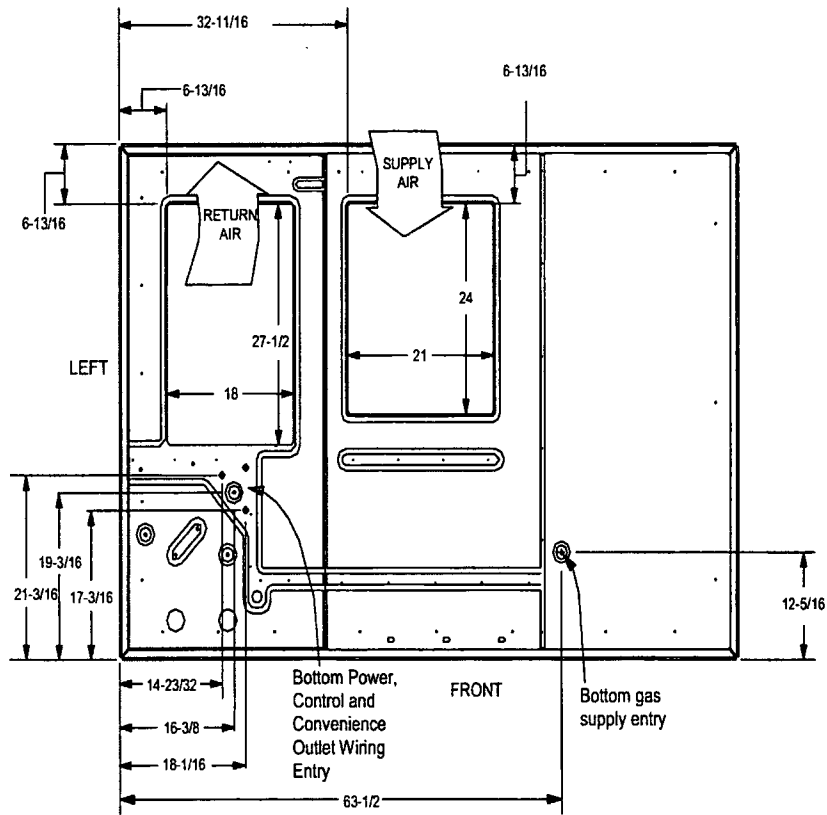


FIGURE 8 - BOTTOM DUCT OPENINGS (FROM ABOVE)

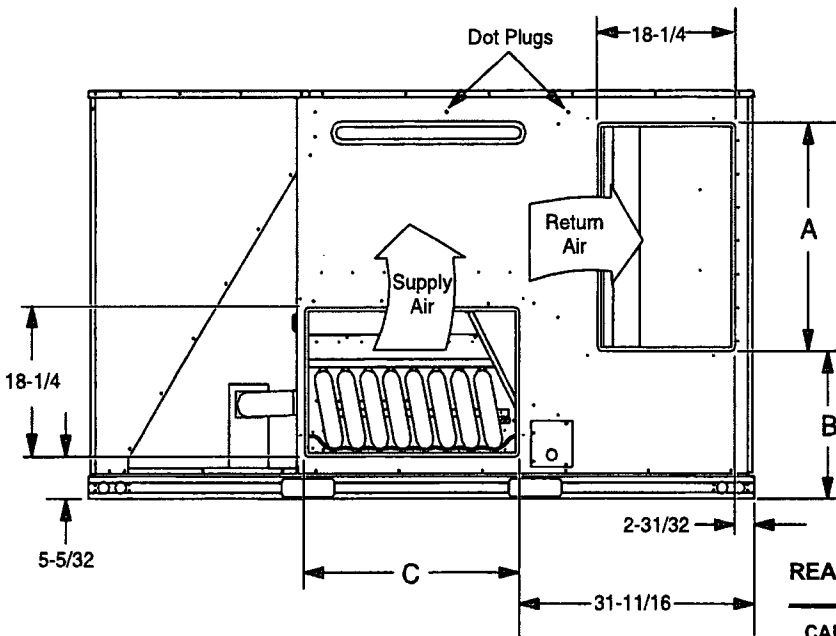


FIGURE 9 - REAR DUCT DIMENSIONS

REAR DUCT DIMENSIONS

| CABINET SIZE | DIMENSION |         |        |
|--------------|-----------|---------|--------|
|              | "A"       | "B"     | "C"    |
| 50 3/4"      | 28 1/4    | 18 1/16 | 28 1/4 |
| 42"          | 27 3/4    | 12 1/16 | 27 1/2 |

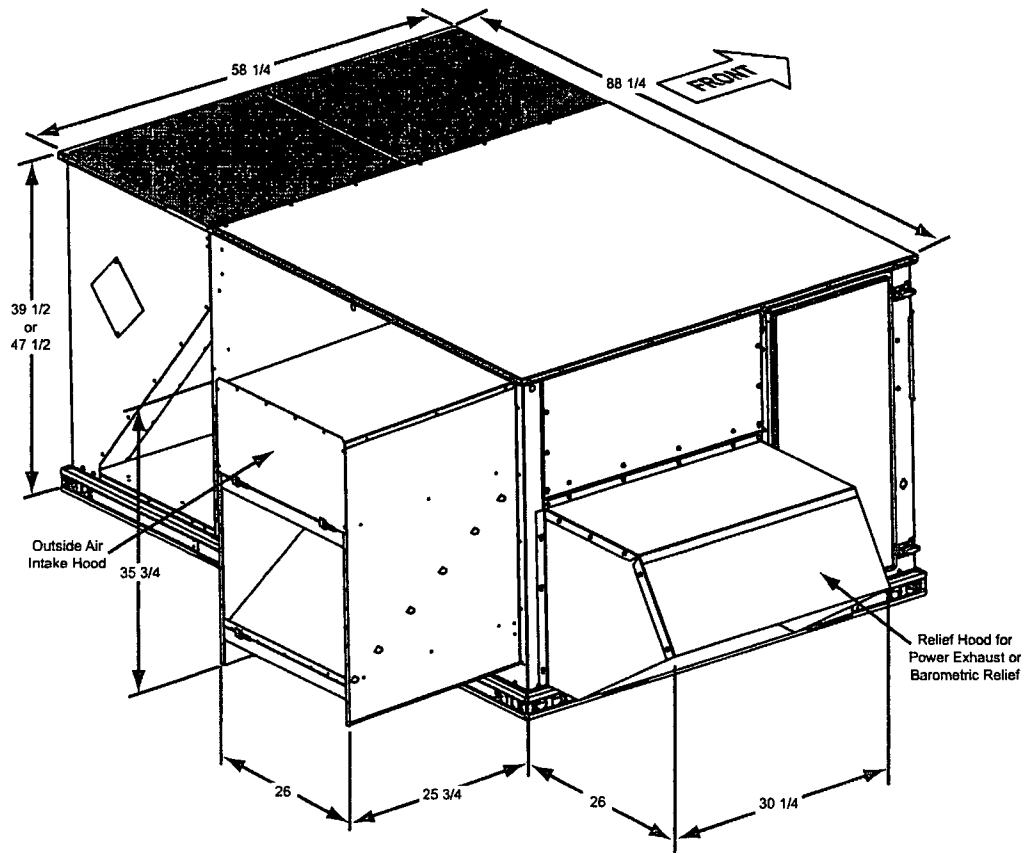


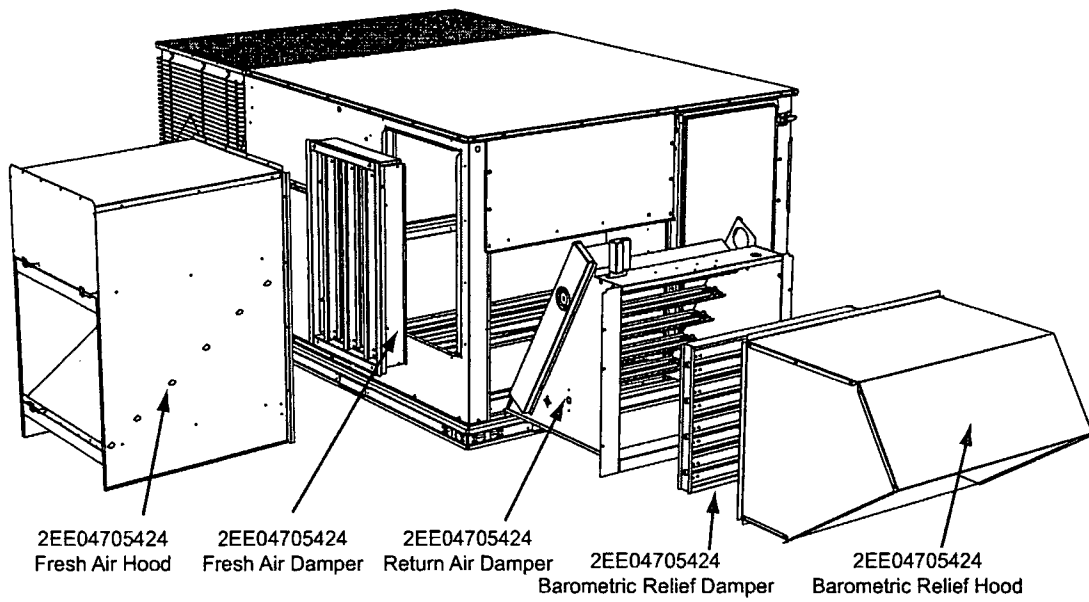
FIGURE 10 -DOWNFLOW ECONOMIZER HOOD DETAIL

TABLE 41: ECONOMIZER USAGE

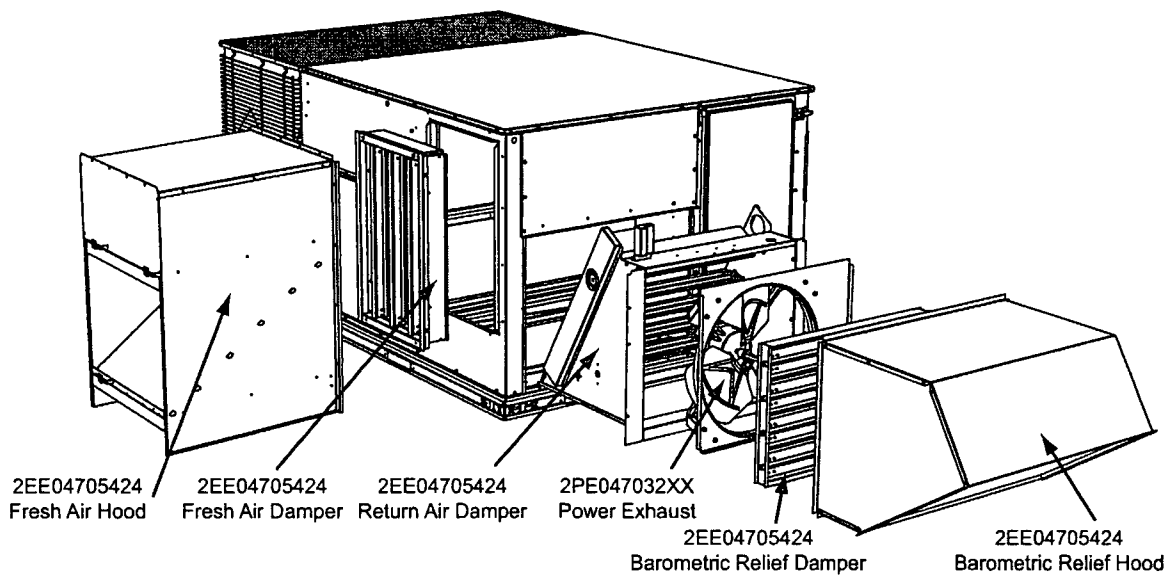
| Application       | Cabinet Height | Description                                     | Model                    |
|-------------------|----------------|---|--------------------------|
| Bottom Return     | All            | Downflow economizer with barometric relief      | 2EE04705424              |
| Side Return       | All            | Horizontal economizer without barometric relief | 2EE04705524 <sup>1</sup> |
| ERV or End Return | 42"            | Slab Economizer, 42" tall cabinet               | 2EE04705624 <sup>2</sup> |
|                   | 50"            | Slab Economizer, 50" tall cabinet               | 2EE04705224 <sup>2</sup> |

- 1 Barometric relief must be ordered separately and installed in duct work.
- 2 Barometric relief or fresh air hood not included. Must be ordered separately.

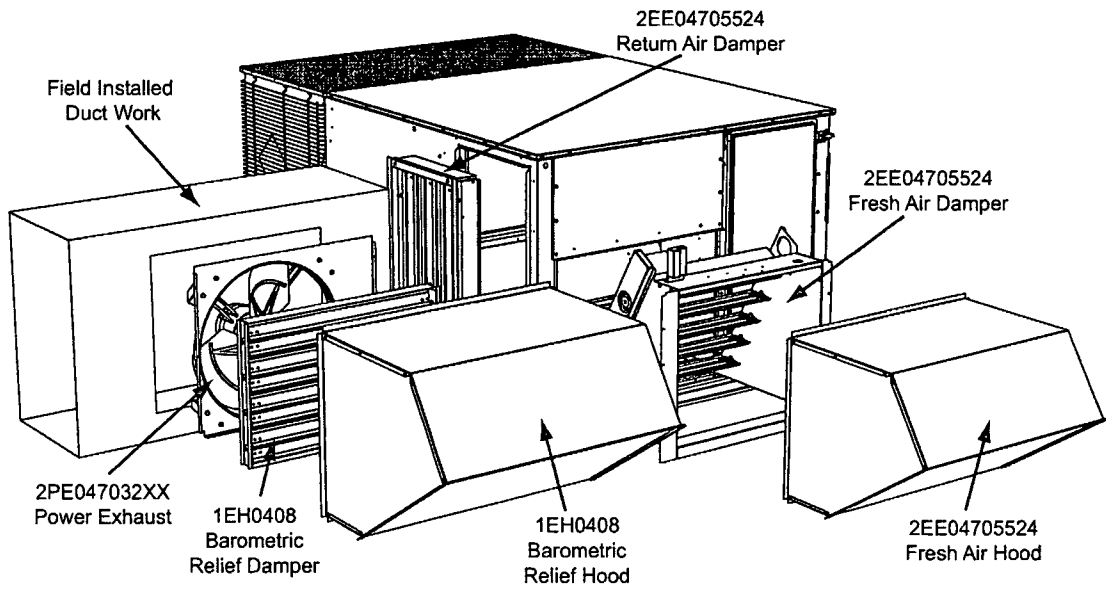




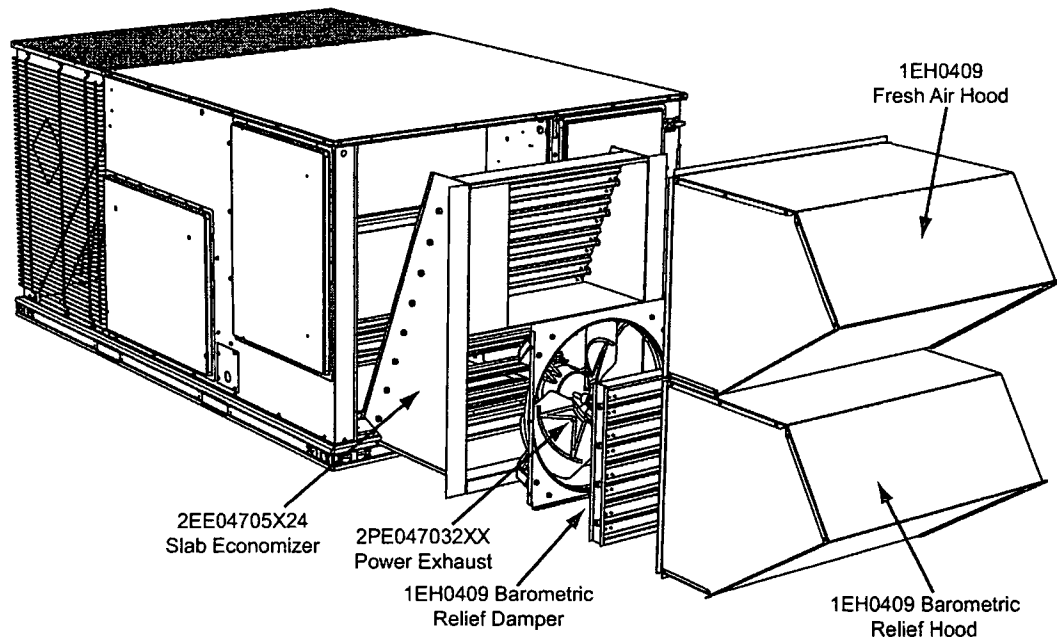
**FIGURE 11 - FACTORY INSTALLED DOWNFLOW ECONOMIZER**



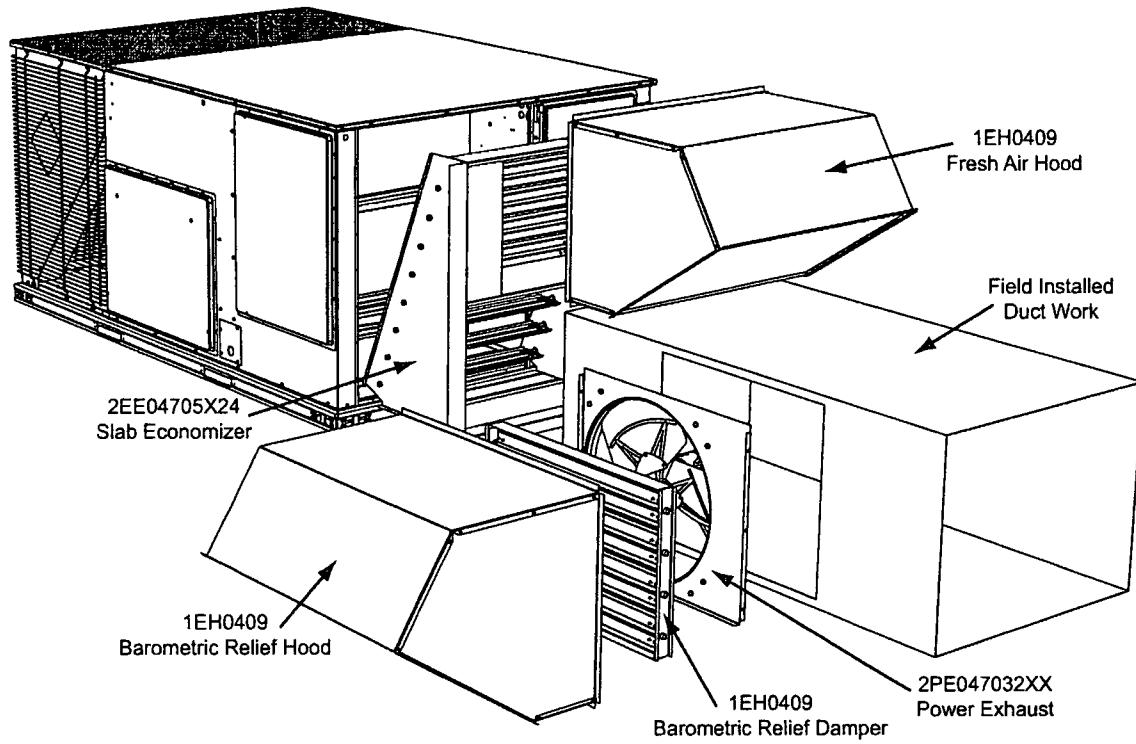
**FIGURE 12 - FIELD INSTALLED DOWNFLOW ECONOMIZER W/POWER EXHAUST**



**FIGURE 13 - FIELD INSTALLED HORIZONTAL ECONOMIZER W/POWER EXHAUST**



**FIGURE 14 - SLAB ECONOMIZER DOWNFLOW W/POWER EXHAUST**



**FIGURE 15 - SLAB ECONOMIZER END RETURN W/POWER EXHAUST**

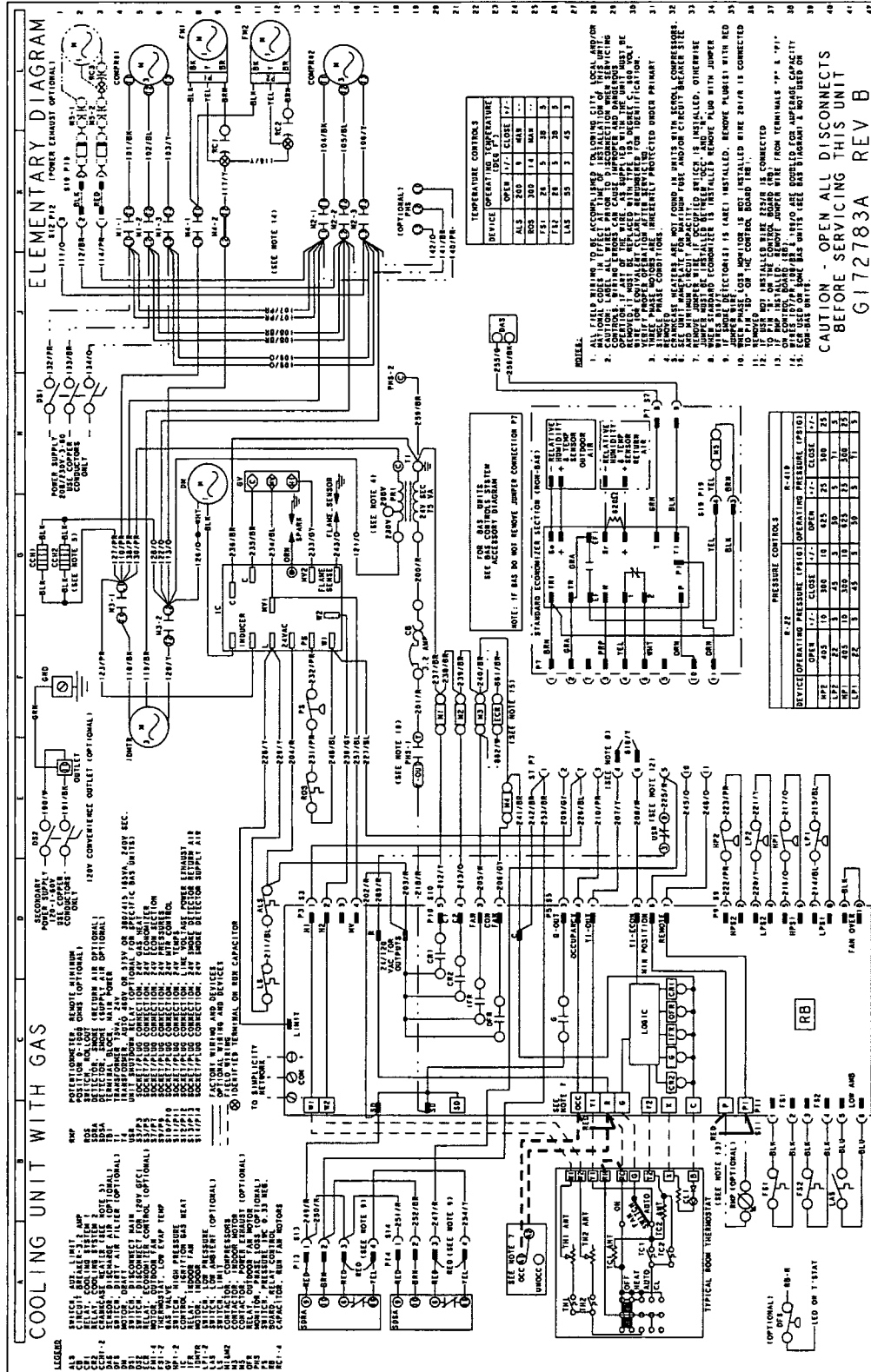


FIGURE 16 - COOLING UNIT WITH GAS HEAT WIRING 230 VOLT DIAGRAM





## GUIDE SPECIFICATIONS

### PREDATOR®

#### DH 078, 090, 102, 120 & 150, 11.5 EER

### GENERAL

Units shall be manufactured by York International Unitary Products Group in an ISO 9001 certified facility. YORK® Predator® units are convertible single packages with a common footprint cabinet and common roof curb for all 6-1/2 through 12-1/2 ton models. All units have two compressors with independent refrigeration circuits to provide 2 stages of cooling. The units were designed for light commercial applications and can be easily installed on a roof curb, slab, or frame. All Predator® units are self-contained and assembled on rigid full perimeter base rails allowing for 3-way forklift access and overhead rigging. Every unit is completely charged, wired, piped, and tested at the factory to provide a quick and easy field installation. All units are convertible between side and down airflow. Independent economizer designs are used on side and down discharge applications, as well as all tonnage sizes. Predator® units are available in the following configurations: cooling only, cooling with electric heat, and cooling with gas heat. Electric heaters are available as factory-installed options or field-installed accessories.

### DESCRIPTION

Units shall be factory assembled, single package, (Elec/Elec, Gas/Elec), designed for outdoor installation. Units shall have a minimum EER of 9.0. They shall have built in field convertible duct connections for down discharge supply/return or horizontal discharge supply/return and be available with factory installed options or field installed accessories. The units shall be factory wired, piped and charged with R-22 refrigerant and factory tested prior to shipment. All unit wiring shall be both numbered and color coded. The cooling performance shall be rated in accordance with DOE and ARI test procedures. Units shall be CSA certified to ANSI Z21.47 and UL 1995/CAN/CSA No. 236-M90 standards.

### UNIT CABINET

Unit cabinet shall be constructed of G90 galvanized steel with exterior surfaces coated with a non-chalking, powder paint finish, certified at 1000 hour salt spray test per ASTM-B117 standards. Indoor blower sections shall be insulated with up to 1" thick insulation coated on the airside. Aluminum foil faced insulation shall be used in the unit's compartments and be fastened to prevent insulation from entering the air stream. Cabinet doors shall be hinged with toolless access for easy servicing and maintenance. Full perimeter base rails shall be provided to assure reliable transit of equipment, overhead rigging, fork truck access and proper sealing on roof curb applications. Disposable 2" filters shall be furnished and be accessible through hinged access door. Fan performance measuring ports shall be provided on the outside of the cabinet to allow accurate air measurements of evaporator fan performance without removing panels or creating bypass

of the coils. Condensate pan shall be slide out design, constructed of a non corrosive material, internally sloped and conforming to ASHRAE 62-B9 standards. Condensate connection shall be a minimum of ¾" I.D. female and be rigid mount connection.

### INDOOR (EVAPORATOR) FAN ASSEMBLY

Fan shall be a belt drive assembly and include an adjustable pitch motor pulley. Job site selected brake horsepower shall not exceed the motors nameplate horsepower rating plus the service factor. Units shall be designed to operate within the service factor. Fan wheel shall be double inlet type with forward curve blades, dynamically balanced to operate smoothly throughout the entire range of operation. Airflow design shall be constant volume. Bearings shall be sealed and permanently lubricated for longer life and no maintenance. Entire blower assembly and motor shall be slide out design.

### OUTDOOR (CONDENSER) FAN ASSEMBLY

The outdoor fans shall be of the direct drive type, discharge air vertically, have aluminum blades riveted to corrosion resistant steel spider brackets and shall be dynamically balanced for smooth operation. The outdoor fan motors shall have permanently lubricated bearings internally protected against overload conditions and staged independently. A cleaning window shall be provided on two sides of the units for coil cleaning.

### REFRIGERANT COMPONENTS

#### Compressors:

- A. Shall be fully hermetic type, direct drive, internally protected with internal high-pressure relief and over temperature protection. The hermetic motor shall be suction gas cooled and have a voltage range of + or - 10% of the unit nameplate voltage.
- B. Shall have internal spring isolation and sound muffling to minimize vibration and noise, and be externally isolated on a dedicated, independent mounting.

#### Coils:

- A. Evaporator and condenser coils shall have aluminum plate fins mechanically bonded to seamless internally enhanced copper tubes with all joints brazed. Special Phenolic coating shall be available as a factory option.
- B. Evaporator and condenser coils shall be of the direct expansion, draw-thru design.

Refrigerant Circuit and Refrigerant Safety Components shall include:

- A. Independent fixed-orifice or thermally operated expansion devices.
- B. Solid core filter drier/strainer to eliminate any moisture or foreign matter.
- C. Accessible service gage connections on both suction and discharge lines to charge, evacuate, and measure refrigerant pressure during any necessary servicing or troubleshooting, without losing charge.
- D. The unit shall have two independent refrigerant circuits, equally split in 50% capacity increments.

#### Unit Controls:

- A. Unit shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-volt transformer side.
- B. Unit shall incorporate a lockout circuit which provides reset capability at the space thermostat or base unit should any of the following standard safety devices trip and shut off compressor:
  - (1) High-pressure switch.
  - (2) Freeze-protection thermostat, evaporator coil. If any of the above safety devices trip, an LED (light-emitting diode) indicator shall flash a diagnostic code that indicates which safety switch has tripped.
- D. Unit shall incorporate "AUTO RESET" compressor over temperature, over current protection.
- E. Unit shall operate with conventional thermostat designs and have a low voltage terminal strip for easy hook-up.
- F. Unit control board shall have on-board diagnostics and fault code display.
- G. Standard controls shall include anti-short cycle and low voltage protection, and permit cooling operation down to 0 °F.
- H. Control board shall monitor each refrigerant safety switch independently.
- I. Control board shall retain last 5 fault codes in non-volatile memory, which will not be lost in the event of a power loss.

#### **GAS HEATING SECTION (IF EQUIPPED)**

Heat exchanger and exhaust system shall be constructed of aluminized steel and shall be designed with induced draft combustion with post purge logic, energy saving direct spark ignition, and redundant main gas valve. The heat exchanger shall be of the tubular type, constructed of T1-40 aluminized steel for corrosion resistance and allowing minimum mixed air entering temperature of 40 °F. Burners shall be of the in-

shot type, constructed of aluminum-coated steel. All gas piping shall enter the unit cabinet at a single location, through either the side or bottom, without any field modifications. An integrated control board shall provide timed control of evaporator fan functioning and burner ignition. Heating section shall be provided with the following minimum protection:

- A. Primary and auxiliary high-temperature limit switches.
- B. Induced draft pressure sensor.
- C. Flame roll out switch (manual reset).
- D. Flame proving controls. Unit shall have two independent stages of capacity (60% 1<sup>st</sup> stage, 100% 2<sup>nd</sup> stage).

#### **ELECTRIC HEATING SECTION (IF EQUIPPED)**

An electric heating section, with nickel chromium elements, shall be provided in a range of 9 thru 54 KW, offering two states of capacity all sizes. The heating section shall have a primary limit control(s) (automatic reset) to prevent the heating element system from operating at an excessive temperature. The Heating Section assembly shall slide out of the unit for easy maintenance and service. Units with Electric Heating Sections shall be wired for a single point power supply with branch circuit fusing (where required).

#### **UNIT OPERATING CHARACTERISTICS**

Unit shall be capable of starting and running at 125 °F outdoor temperature, exceeding maximum load criteria of ARI Standard 340/360. The compressor, with standard controls, shall be capable of operation down to 0 °F outdoor temperature. Unit shall be provided with fan time delay to prevent cold air delivery before heat exchanger warms up. (Gas heat only)

**ELECTRICAL REQUIREMENTS** - All unit power wiring shall enter unit cabinet at a single factory provided location and be capable of side or bottom entry to minimize roof penetrations and avoid unit field modifications. Separate side and bottom openings shall be provided for the control wiring.

**STANDARD LIMITED WARRANTIES** - Compressor – 5 Years, Heat Exchanger – 10 Years, Elect. Heat Elem. – 5 Years, Parts – 1 Year

**FACTORY INSTALLED OPTIONAL OUTDOOR AIR** (Shall be made available by either/or):

1. **ELECTRONIC ENTHALPY AUTOMATIC ECONOMIZER** – Outdoor and return air dampers that are interlocked and positioned by a fully-modulating, spring-return damper actuator. The maximum leakage rate for the outdoor air intake dampers shall not exceed 2% when dampers are fully closed and operating against a pressure differential of 0.5 IWG. A unit-mounted potentiometer shall be provided to adjust the outdoor and return air damper assembly to take in outdoor air to meet the minimum ventilation requirement of the conditioned space during normal operation. During economizer operation, a mixed-air temperature control shall modulate the



outdoor and return air damper assembly to prevent the supply air temperature from dropping below 55 °F. Changeover from compressor to economizer operation shall be provided by an integral electronic enthalpy control that feeds input into the basic module. The outdoor intake opening shall be covered with a rain hood that matches the exterior of the unit. Water eliminator/filters shall be provided. Simultaneous economizer/compressor operation is also possible. Dampers shall fully close on power loss. Available with barometric relief or power exhaust.

2. **MOTORIZED OUTDOOR AIR DAMPERS** – Outdoor and return air dampers that are interlocked and positioned by a 2-position, spring-return damper actuator. The maximum leakage rate for the outdoor air intake dampers shall not exceed 2% when dampers are fully closed and operating against a pressure differential of 0.5 IWG. A unit-mounted potentiometer shall be provided to adjust the outdoor and return air damper assembly to take in the design CFM of outdoor air to meet the ventilation requirements of the conditioned space during normal operation. Whenever the indoor fan motor is energized, the dampers open up to one of two pre-selected positions – regardless of the outdoor air enthalpy. Dampers return to the fully closed position when the indoor fan motor is de-energized. Dampers shall fully close on power loss.

#### ADDITIONAL FACTORY INSTALLED OPTIONS

- **ALTERNATE INDOOR BLOWER MOTOR** – For applications with high restrictions, units are available with optional indoor blower motors that provide higher static output and/or higher airflow.
- **CONVENIENCE OUTLET (POWERED/NON-POWERED)**– Unit can be provided with an optional 120VAC GFCI outlet with cover on the corner of the unit housing the compressors.
- **ELECTRIC HEAT** - Electric Heaters range from 9 kW to 54 kW and are available in all the voltage options of the base unit.
- **PHASE MONITOR** - Designed to prevent damage in out-of-phase condition.
- **COIL GUARD** - Designed to prevent condenser coil damage.
- **BAS CONTROLS** - Include supply air sensor, return air sensor, dirty filter indicator and air proving switch.
- **DIRTY FILTER SWITCH** – This kit includes a differential pressure switch that energizes the fault light on the unit thermostat, indicating that there is an abnormally high-pressure drop across the filters.
- **BREAKER** – An HACR breaker can be factory installed on gas heat units or cooling units with electric heat.
- **DISCONNECT SWITCH** - A disconnect can be factory installed on a cooling only units sized for the largest electric heat available.
- **STAINLESS STEEL HEAT EXCHANGER** – For applications in a corrosive environment, this option provides a full stainless steel heat exchanger assembly.
- **SMOKE DETECTOR** – A smoke detector can be factory mounted and wired in the supply and/or return air compartments.

#### OTHER PRE-ENGINEERED ACCESSORIES AVAILABLE

- **ROOF CURB** - 14" and 8" high, full perimeter knockdown curb, with hinged design for quick assembly.
- **BAROMETRIC RELIEF DAMPER** – (Unit mounted – Downflow, Duct Mounted – Horizontal) – Contains a rain hood, air inlet screen, exhaust damper and mounting hardware. Used to relieve internal air pressure through the unit during economizer operation.
- **PROPANE CONVERSION KIT** – Contains new orifices and gas valve springs to convert from natural to L.P. gas.
- **60°F GAS HEAT KIT** – Provides an electric heat kit for the gas compartment for use in extreme low ambient conditions.
- **ECONOMIZER** (Downflow and Horizontal flow)
- **POWER EXHAUST** – (Unit mount – Downflow, Duct mount – Horizontal flow)
- **DUAL ENTHALPY KIT** - Provides a second input to economizer to monitor return air.

**2007-4587+5R W/W PP  
HVAC Load Analysis**

for

McDonald's Restaurant  
Tukwila, WA  
Site ID: 046-0005-00-0

**FILE COPY**

Permit No. \_\_\_\_\_

**Elite Software**

**CHVAC COMMERCIAL  
HVAC LOADS**

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*DL* *Q*  
City Of Tukwila  
BUILDING DIVISION

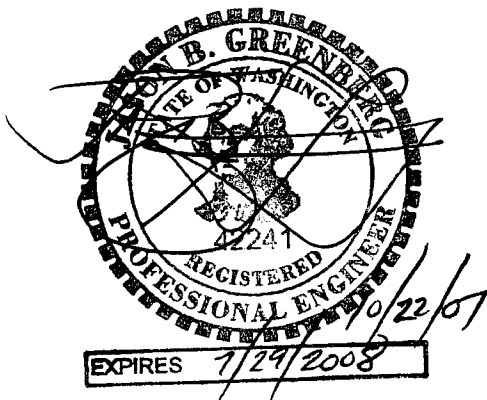
Prepared By:

U.S. Restaurant Design  
2111 McDonald's Drive, Dept. #043  
Oak Brook, IL 60523

Wednesday, October 17, 2007

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**DOB-243**





## General Project Data Input

### General Project Information

Project file name: K:\Div\West\ Northwest\046-0005-00-0 Tukwila\HVAC\046-0005-00-0.CHV  
 Project title: 2007-4587+5R W/W PP  
 Project address: 15210 Pacific Hwy. South.  
 Project city, state, ZIP: Tukwila, WA 98188  
 Project date: October 10, 2007  
 Weather reference city: SEATTLE, WASHINGTON, USA  
 Client name: McDonald's Restaurant  
 Client address: Tukwila, WA  
 Client city: Site ID: 046-0005-00-0  
 Company name: U.S. Restaurant Design  
 Company address: 2111 McDonald's Drive, Dept. #043  
 Company city: Oak Brook, IL 60523

Barometric pressure: 29.491 in.Hg.  
 Altitude: 400 feet  
 Latitude: 47 Degrees  
 Mean daily temperature range: 26 Degrees  
 Starting & ending time for HVAC load calculations: 6am - 11pm  
 Number of unique zones in this project: 10

### Building Default Values

Calculations performed: Both heating and cooling loads  
 Lighting requirements: 2.00 Watts per square foot  
 Equipment requirements: 0.00 Watts per square foot  
 People sensible load multiplier: 240 Btuh per person  
 People latent load multiplier: 310 Btuh per person  
 Zone sensible safety factor: 0 %  
 Zone latent safety factor: 0 %  
 Zone heating safety factor: 0 %  
 People diversity factor: 100 %  
 Lighting profile number: 1  
 Equipment profile number: 2  
 People profile number: 3  
 Building default ceiling height: 9.00 feet  
 Building default wall height: 12.00 feet

### Internal Operating Load Profiles (C=100)

|    | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr | hr |   |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|
|    | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |   |
| 1  | 0  | 0  | 0  | 0  | 0  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | 0  |   |
| 2  | 0  | 0  | 0  | 0  | 0  | 55 | 60 | 65 | 70 | 75 | 80 | 90 | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | 0 |
| 3  | 0  | 0  | 0  | 0  | 0  | 10 | 25 | 50 | 50 | 50 | 75 | C  | C  | 75 | 50 | 50 | 75 | 80 | 50 | 25 | 25 | 10 | 10 | 0  |   |
| 4  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C |
| 5  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C |
| 6  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C |
| 7  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C |
| 8  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C |
| 9  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C |
| 10 | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C  | C |



### General Project Data Input (cont'd)

#### Building-Level Design Conditions

| Design Month | Outdoor Dry Bulb | Outdoor Wet Bulb | Indoor Rel. Hum | Indoor Dry Bulb | Grains Diff | In/Outdoor Correction |
|--------------|------------------|------------------|-----------------|-----------------|-------------|-----------------------|
| August       | 86               | 68               | 50%             | 75              | 9.62        | -9                    |
| June         | 84               | 66               | 50%             | 75              | 2.57        | -11                   |
| July         | 88               | 69               | 50%             | 75              | 11.70       | -7                    |
| September    | 80               | 65               | 50%             | 75              | 4.02        | -15                   |
| January      | 54               | 48               | 50%             | 75              | -24.90      | -41                   |
| February     | 59               | 50               | 50%             | 75              | -25.74      | -36                   |
| Winter       | 21               |                  |                 | 75              |             |                       |

#### Master Roofs

| Roof No. | ASHRAE Roof# | Roof U-Fac | Dark Color | Susp. Ceil |
|----------|--------------|------------|------------|------------|
| 1        | 2            | 0.030      | No         | Yes        |

#### Master Walls

| Wall No. | ASHRAE Group | Wall U-Fac | Wall Color |
|----------|--------------|------------|------------|
| 1        | B            | 0.049      | M          |

#### Master Glass

| Glass No. | Summer U-Factor | Winter U-Factor | Glass Shd. Coef. | Interior Shading | Interior Shd. Coef |
|-----------|-----------------|-----------------|------------------|------------------|--------------------|
| 1         | 0.630           | 0.630           | 0.760            | 2                | 0.000              |

#### Master Shading Devices

| Shade No. | Dist Horiz Overh Projects | Dist Beyond Right W.Edge | Dist Beyond Left W.Edge | Dist Overh Above Wind | Dist Right Fin Proj | Dist R-Fin Beyond W.Edge | Ht Of Right Fin | Dist Left Fin Proj | Dist L-Fin Beyond W.Edge | Ht Of Left Fin |
|-----------|---------------------------|--------------------------|-------------------------|-----------------------|---------------------|--------------------------|-----------------|--------------------|--------------------------|----------------|
| 1         | 2.75                      | 0.83                     | 0.83                    | 0.00                  | 0.00                | 0.00                     | 0.00            | 0.00               | 0.00                     | 0.00           |
| 2         | 2.75                      | 0.83                     | 0.83                    | 0.00                  | 0.00                | 0.00                     | 0.00            | 0.00               | 0.00                     | 0.00           |
| 3         | 3.83                      | 1.67                     | 1.67                    | 3.33                  | 0.00                | 0.00                     | 0.00            | 0.00               | 0.00                     | 0.00           |
| 4         | 3.83                      | 0.00                     | 0.00                    | 0.00                  | 0.00                | 0.00                     | 0.00            | 0.00               | 0.00                     | 0.00           |
| 5         | 3.83                      | 0.00                     | 0.00                    | 2.00                  | 0.00                | 0.00                     | 0.00            | 0.00               | 0.00                     | 0.00           |



## Air Handler Input

### Air Handler Number 1 Input Data

Name: D-1 Dining & Toilets  
 Terminal type: Constant Volume  
 Method for CV: Proportion  
 Supply fan type: Package fan  
 Calculations performed: Both heating and cooling loads  
 Excess supply air: Adjust  
 Occurrences: 1  
 People profile number: 3  
 Lighting profile number: 1  
 Equipment profile number: 0  
 Exhaust may not exceed supply air: No  
 Leaving heating coil CFM: 0.0  
 Leaving cooling coil temp (deg.F): 57.0  
 Cooling coil CFM: 4,000  
 Misc. Btuh gain - supply side: 0  
 Misc. Btuh gain - return side: 0  
 Combined fan & motor efficiency: 0  
 Static pressure across fan (in.wg.): 0.00  
 Summer supply duct temp rise (deg.F): 0.000  
 Summer return duct temp rise (deg.F): 0.000  
 Winter supply duct temp drop (deg.F): 0.000  
 Winter return duct temp drop (deg.F): 0.000  
 Chilled water temp difference (deg.F): 0.000  
 Hot water temp difference (deg.F): 0.000  
 Cooling ventilation: 1500 Direct  
 Cooling infiltration: 0 AC/Hr  
 Heating ventilation: 1500 Direct  
 Heating infiltration: 0 AC/Hr  
 Pretreated outside air: none  
 Pretreated air Summer DB (deg.F): 0  
 Pretreated air Summer WB (deg.F): 0  
 Pretreated air Winter DB (deg.F): 0

| Design Month | Outdoor Dry Bulb | Outdoor Wet Bulb | Indoor Rel.Hum | Indoor Dry Bulb | Grains Diff | In/Outdoor Correction |
|--------------|------------------|------------------|----------------|-----------------|-------------|-----------------------|
| August       | 86               | 68               | 50%            | 75              | 9.62        | -9                    |
| June         | 84               | 66               | 50%            | 75              | 2.57        | -11                   |
| July         | 88               | 69               | 50%            | 75              | 11.70       | -7                    |
| September    | 80               | 65               | 50%            | 75              | 4.02        | -15                   |
| January      | 54               | 48               | 50%            | 75              | -24.90      | -41                   |
| February     | 59               | 50               | 50%            | 75              | -25.74      | -36                   |
| Winter       | 21               |                  |                | 75              |             |                       |

### Air Handler Number 2 Input Data

Name: K-1 Kitchen  
 Terminal type: Constant Volume  
 Method for CV: Proportion  
 Supply fan type: Package fan  
 Calculations performed: Both heating and cooling loads  
 Excess supply air: Adjust  
 Occurrences: 1  
 People profile number: 1  
 Lighting profile number: 1  
 Equipment profile number: 2  
 Exhaust may not exceed supply air: No  
 Leaving heating coil CFM: 0.0



### Air Handler Input (cont'd)

#### Air Handler Number 2 Input Data

Leaving cooling coil temp (deg.F): 57.0  
 Cooling coil CFM 5,000  
 Misc. Btuh gain - supply side: 0  
 Misc. Btuh gain - return side: 0  
 Combined fan & motor efficiency: 0  
 Static pressure across fan (in.wg.): 0.00  
 Summer supply duct temp rise (deg.F): 0.000  
 Summer return duct temp rise (deg.F): 0.000  
 Winter supply duct temp drop (deg.F): 0.000  
 Winter return duct temp drop (deg.F): 0.000  
 Chilled water temp difference (deg.F): 0.000  
 Hot water temp difference (deg.F): 0.000  
 Cooling ventilation: 1800 Direct  
 Cooling infiltration: 0 AC/Hr  
 Heating ventilation: 1800 Direct  
 Heating infiltration: 0 AC/Hr  
 Pretreated outside air: none  
 Pretreated air Summer DB (deg.F): 0  
 Pretreated air Summer WB (deg.F): 0  
 Pretreated air Winter DB (deg.F): 0

| Design Month | Outdoor Dry Bulb | Outdoor Wet Bulb | Indoor Rel.Hum | Indoor Dry Bulb | Grains Diff | In/Outdoor Correction |
|--------------|------------------|------------------|----------------|-----------------|-------------|-----------------------|
| August       | 86               | 68               | 50%            | 75              | 9.62        | -9                    |
| June         | 84               | 66               | 50%            | 75              | 2.57        | -11                   |
| July         | 88               | 69               | 50%            | 75              | 11.70       | -7                    |
| September    | 80               | 65               | 50%            | 75              | 4.02        | -15                   |
| January      | 54               | 48               | 50%            | 75              | -24.90      | -41                   |
| February     | 59               | 50               | 50%            | 75              | -25.74      | -36                   |
| Winter       | 21               |                  |                | 75              |             |                       |

#### Air Handler Number 3 Input Data

Name: K-2 Support Areas  
 Terminal type: Constant Volume  
 Method for CV: Proportion  
 Supply fan type: Package fan  
 Calculations performed: Both heating and cooling loads  
 Excess supply air: Adjust  
 Occurrences: 1  
 People profile number: 1  
 Lighting profile number: 1  
 Equipment profile number: 2  
 Exhaust may not exceed supply air: No  
 Leaving heating coil CFM: 0.0  
 Leaving cooling coil temp (deg.F): 57.0  
 Cooling coil CFM 1,350  
 Misc. Btuh gain - supply side: 0  
 Misc. Btuh gain - return side: 0  
 Combined fan & motor efficiency: 0  
 Static pressure across fan (in.wg.): 0.00  
 Summer supply duct temp rise (deg.F): 0.000  
 Summer return duct temp rise (deg.F): 0.000  
 Winter supply duct temp drop (deg.F): 0.000  
 Winter return duct temp drop (deg.F): 0.000  
 Chilled water temp difference (deg.F): 0.000  
 Hot water temp difference (deg.F): 0.000

**Air Handler Input (cont'd)**

**Air Handler Number 3 Input Data**

Cooling ventilation: 700 Direct  
 Cooling infiltration: 0 AC/Hr  
 Heating ventilation: 700 Direct  
 Heating infiltration: 0 AC/Hr  
 Pretreated outside air: none  
 Pretreated air Summer DB (deg.F): 0  
 Pretreated air Summer WB (deg.F): 0  
 Pretreated air Winter DB (deg.F): 0

| Design Month | Outdoor Dry Bulb | Outdoor Wet Bulb | Indoor Rel. Hum | Indoor Dry Bulb | Grains Diff | In/Outdoor Correction |
|--------------|------------------|------------------|-----------------|-----------------|-------------|-----------------------|
| August       | 86               | 68               | 50%             | 75              | 9.62        | -9                    |
| June         | 84               | 66               | 50%             | 75              | 2.57        | -11                   |
| July         | 88               | 69               | 50%             | 75              | 11.70       | -7                    |
| September    | 80               | 65               | 50%             | 75              | 4.02        | -15                   |
| January      | 54               | 48               | 50%             | 75              | -24.90      | -41                   |
| February     | 59               | 50               | 50%             | 75              | -25.74      | -36                   |
| Winter       | 21               |                  |                 | 75              |             |                       |

**Air Handler Number 4 Input Data**

Name: P-1 Playplace  
 Terminal type: Constant Volume  
 Method for CV: Proportion  
 Supply fan type: Package fan  
 Calculations performed: Both heating and cooling loads  
 Excess supply air: Adjust  
 Occurrences: 1  
 People profile number: 3  
 Lighting profile number: 1  
 Equipment profile number: 0  
 Exhaust may not exceed supply air: No  
 Leaving heating coil CFM: 0.0  
 Leaving cooling coil temp (deg.F): 57.0  
 Cooling coil CFM: 3,000  
 Misc. Btuh gain - supply side: 0  
 Misc. Btuh gain - return side: 0  
 Combined fan & motor efficiency: 0  
 Static pressure across fan (in.wg.): 0.00  
 Summer supply duct temp rise (deg.F): 0.000  
 Summer return duct temp rise (deg.F): 0.000  
 Winter supply duct temp drop (deg.F): 0.000  
 Winter return duct temp drop (deg.F): 0.000  
 Chilled water temp difference (deg.F): 0.000  
 Hot water temp difference (deg.F): 0.000  
 Cooling ventilation: 1000 Direct  
 Cooling infiltration: 0 AC/Hr  
 Heating ventilation: 1000 Direct  
 Heating infiltration: 0 AC/Hr  
 Pretreated outside air: none  
 Pretreated air Summer DB (deg.F): 0  
 Pretreated air Summer WB (deg.F): 0  
 Pretreated air Winter DB (deg.F): 0

| Design Month | Outdoor Dry Bulb | Outdoor Wet Bulb | Indoor Rel. Hum | Indoor Dry Bulb | Grains Diff | In/Outdoor Correction |
|--------------|------------------|------------------|-----------------|-----------------|-------------|-----------------------|
| August       | 86               | 68               | 50%             | 75              | 9.62        | -9                    |



### Air Handler Input (cont'd)

#### Air Handler Number 4 Input Data

|           |    |    |     |    |        |     |
|-----------|----|----|-----|----|--------|-----|
| June      | 84 | 66 | 50% | 75 | 2.57   | -11 |
| July      | 88 | 69 | 50% | 75 | 11.70  | -7  |
| September | 80 | 65 | 50% | 75 | 4.02   | -15 |
| January   | 54 | 48 | 50% | 75 | -24.90 | -41 |
| February  | 59 | 50 | 50% | 75 | -25.74 | -36 |
| Winter    | 21 |    |     | 75 |        |     |





## Building Envelope Report

### Envelope Report Using Summer U-Factors

| Material Types |   | Gross Area | Glass Area | Net Area | U-Factor | Area x U-Factor | Average U-Factor |
|----------------|---|------------|------------|----------|----------|-----------------|------------------|
| Roof           | 1 | 5,136.0    | 0.0        | 5,136.0  | 0.030    | 154.080         | 0.030            |
| Tot. Roof      |   | 5,136.0    | 0.0        | 5,136.0  | N/A      | 154.080         | 0.030            |
| Wall           | 1 | 5,463.9    | 947.9      | 4,516.0  | 0.049    | 221.284         | 0.049            |
| Tot. Wall      |   | 5,463.9    | 947.9      | 4,516.0  | N/A      | 221.284         | 0.049            |
| Glass          | 1 | 947.9      | N/A        | 947.9    | 0.630    | 597.181         | 0.630            |
| Tot. Glass     |   | 947.9      | N/A        | 947.9    | N/A      | 597.181         | 0.630            |
| Totals         |   |            |            | 10,599.9 |          | 972.545         | 0.092            |

| Wall Direction | Wall Area | Glass Area | Wall Net Area | Wall Avg U-Factor | Glass Avg U-Factor | Glass Avg Shd. Coef |
|----------------|-----------|------------|---------------|-------------------|--------------------|---------------------|
| N              | 1,867.8   | 357.0      | 1,510.8       | 0.049             | 0.630              | 0.760               |
| NE             | 0.0       | 0.0        | 0.0           | 0.000             | 0.000              | 0.000               |
| E              | 830.1     | 8.5        | 821.6         | 0.049             | 0.630              | 0.760               |
| SE             | 0.0       | 0.0        | 0.0           | 0.000             | 0.000              | 0.000               |
| S              | 1,895.2   | 343.0      | 1,552.2       | 0.049             | 0.630              | 0.760               |
| SW             | 0.0       | 0.0        | 0.0           | 0.000             | 0.000              | 0.000               |
| W              | 870.8     | 239.4      | 631.4         | 0.049             | 0.630              | 0.760               |
| NW             | 0.0       | 0.0        | 0.0           | 0.000             | 0.000              | 0.000               |
| Totals         | 5,463.9   | 947.9      | 4,516.0       | 0.049             | 0.630              | 0.760               |



### Building Summary Loads

Building peaks in July at 1pm.

| Bldg Load Descriptions | Area Quan | Sen Loss       | %Tot Loss     | Lat Gain       | Sen Gain       | Net Gain       | %Net Gain     |
|------------------------|-----------|----------------|---------------|----------------|----------------|----------------|---------------|
| Roof                   | 5,136     | 8,320          | 2.37          | 0              | 2,013          | 2,013          | 0.53          |
| Wall                   | 4,516     | 11,949         | 3.41          | 0              | 1,040          | 1,040          | 0.27          |
| Glass                  | 948       | 32,248         | 9.20          | 0              | 28,984         | 28,984         | 7.63          |
| Floor Slab             | 302       | 10,590         | 3.02          | 0              | 0              | 0              | 0.00          |
| <b>Skin Loads</b>      |           | <b>63,107</b>  | <b>18.00</b>  | <b>0</b>       | <b>32,037</b>  | <b>32,037</b>  | <b>8.44</b>   |
| Lighting               | 10,006    | 0              | 0.00          | 0              | 34,142         | 34,142         | 8.99          |
| Equipment              | 25,500    | 0              | 0.00          | 9,900          | 87,010         | 96,910         | 25.52         |
| People                 | 168       | 0              | 0.00          | 63,300         | 43,680         | 106,980        | 28.17         |
| Partition              | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Cool. Pret.            | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Heat. Pret.            | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Cool. Vent.            | 5,000     | 0              | 0.00          | 55,465         | 54,210         | 109,674        | 28.88         |
| Heat. Vent.            | 5,000     | 287,410        | 82.00         | 0              | 0              | 0              | 0.00          |
| Cool. Infil.           | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Heat. Infil.           | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Draw-Thru Fan          | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Blow-Thru Fan          | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Reserve Cap.           | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Reheat Cap.            | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Supply Duct            | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Return Duct            | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Misc. Supply           | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Misc. Return           | 0         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| <b>Building Totals</b> |           | <b>350,517</b> | <b>100.00</b> | <b>128,665</b> | <b>251,078</b> | <b>379,743</b> | <b>100.00</b> |

| Building Summary       | Sen Loss       | %Tot Loss     | Lat Gain       | Sen Gain       | Net Gain       | %Net Gain     |
|------------------------|----------------|---------------|----------------|----------------|----------------|---------------|
| Ventilation            | 287,410        | 82.00         | 55,465         | 54,210         | 109,674        | 28.88         |
| Infiltration           | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Pretreated Air         | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Zone Loads             | 63,107         | 18.00         | 73,200         | 196,868        | 270,068        | 71.12         |
| Plenum Loads           | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| Fan & Duct Loads       | 0              | 0.00          | 0              | 0              | 0              | 0.00          |
| <b>Building Totals</b> | <b>350,517</b> | <b>100.00</b> | <b>128,665</b> | <b>251,078</b> | <b>379,743</b> | <b>100.00</b> |

### Check Figures

|  |                    |
|--|--------------------|
| Total Building Supply Air (based on a 14° TD): | 13,350 CFM         |
| Total Building Vent. Air (37.45% of Supply):   | 5,000 CFM          |
| Total Conditioned Air Space:                   | 5,003 Sq.ft        |
| Supply Air Per Unit Area:                      | 2.6684 CFM/Sq.ft   |
| Area Per Cooling Capacity:                     | 158.0966 Sq.ft/Ton |
| Cooling Capacity Per Area:                     | 0.0063 Tons/Sq.ft  |
| Heating Capacity Per Area:                     | 70.06 Btuh/Sq.ft   |
| Total Heating Required With Outside Air:       | 350,517 Btuh       |
| Total Cooling Required With Outside Air:       | 31.65 Tons         |

### Air Handler #1 - D-1 Dining & Toilets - Summary Loads

| Zn No | Description<br>Zone Peak Time | Area<br>People<br>Volume | Htg Loss<br>Htg CFM<br>CFM/Sqft | Sen Gain<br>Clg CFM<br>CFM/Sqft | Lat Gain<br>S Exh<br>W/Exh | Htg O/A<br>Req CFM<br>Act CFM | Clg O/A<br>Req CFM<br>Act CFM |
|-------|-------------------------------|--------------------------|---------------------------------|---------------------------------|----------------------------|-------------------------------|-------------------------------|
| 2     | Toilet<br>6pm July            | 138<br>0<br>1,104        | 1,714<br>358<br>2.59            | 1,274<br>85<br>0.62             | 0<br>0<br>0                | Direct<br>95<br>134           | Direct<br>95<br>32            |
| 3     | Vestibule 1<br>6pm June       | 42<br>0<br>391           | 3,711<br>775<br>18.45           | 4,658<br>312<br>7.43            | 0<br>0<br>0                | Direct<br>34<br>291           | Direct<br>34<br>117           |
| 4     | Vestibule 2<br>5pm January    | 45<br>0<br>419           | 2,493<br>521<br>11.57           | 3,813<br>256<br>5.68            | 0<br>0<br>0                | Direct<br>36<br>195           | Direct<br>36<br>96            |
| 10    | Dining<br>1pm September       | 1,551<br>111<br>15,510   | 11,235<br>2,346<br>1.51         | 49,934<br>3,347<br>2.16         | 34,410<br>0<br>0           | Direct<br>1,335<br>880        | Direct<br>1,335<br>1,255      |
|       | Zone Peak Totals:             | 1,776                    | 19,152                          | 59,678                          | 34,410                     |                               |                               |
|       | Total Zones: 4                | 111                      | 4,000                           | 4,000                           | 0                          | 1,500                         | 1,500                         |
|       | Unique Zones: 4               | 17,423                   | 2.25                            | 2.25                            | 0                          | 1,500                         | 1,500                         |



## Air Handler #1 - D-1 Dining & Toilets - Total Load Summary

Air Handler Description: D-1 Dining & Toilets Constant Volume - Proportion  
 Sensible Heat Ratio: 0.61 --- This system occurs 1 time(s) in the building. ---  
 Air System Peak Time: 1pm in July.  
 Outdoor Conditions: 85° DB, 69° WB, 81.92 grains

Because of the diversity in zone, plenum and ventilation loads, the zone sensible peak time in September at 1pm is different from the total system peak time, hence the air system CFM was computed using a zone sensible load of 53,787.

Summer: Ventilation controls outside air, --- Winter: Ventilation controls outside air.

|  |             |           |              |
|--|-------------|-----------|--------------|
| Zone Space sensible loss:                                    | 19,152 Btuh |           |              |
| Infiltration sensible loss:                                  | 0 Btuh      | 0 CFM     |              |
| Outside Air sensible loss:                                   | 86,223 Btuh | 1,500 CFM |              |
| Supply Duct sensible loss:                                   | 0 Btuh      |           |              |
| Return Duct sensible loss:                                   | 0 Btuh      |           |              |
| Return Plenum sensible loss:                                 | 0 Btuh      |           |              |
| Total System sensible loss:                                  |             |           | 105,375 Btuh |
| Heating Supply Air: $19,152 / (.986 \times 1.08 \times 4) =$ |             | 4,000 CFM |              |
| Winter Vent Outside Air (37.5% of supply) =                  |             | 1,500 CFM |              |
| Zone space sensible gain:                                    | 52,660 Btuh |           |              |
| Infiltration sensible gain:                                  | 0 Btuh      |           |              |
| Draw-thru fan sensible gain:                                 | 0 Btuh      |           |              |
| Supply duct sensible gain:                                   | 0 Btuh      |           |              |
| Total sensible gain on supply side of coil:                  |             |           | 52,660 Btuh  |
| Cooling Supply Air: $53,787 / (.986 \times 1.1 \times 12) =$ |             | 4,000 CFM |              |
| Summer Vent Outside Air (37.5% of supply) =                  |             | 1,500 CFM |              |
| Return duct sensible gain:                                   | 0 Btuh      |           |              |
| Return plenum sensible gain:                                 | 0 Btuh      |           |              |
| Outside air sensible gain:                                   | 16,263 Btuh | 1,500 CFM |              |
| Blow-thru fan sensible gain:                                 | 0 Btuh      |           |              |
| Total sensible gain on return side of coil:                  |             |           | 16,263 Btuh  |
| Total sensible gain on air handling system:                  |             |           | 68,923 Btuh  |
| Zone space latent gain:                                      | 34,410 Btuh |           |              |
| Infiltration latent gain:                                    | 0 Btuh      |           |              |
| Outside air latent gain:                                     | 16,639 Btuh |           |              |
| Total latent gain on air handling system:                    |             |           | 51,049 Btuh  |
| Total system sensible and latent gain:                       |             |           | 119,972 Btuh |

### Check Figures

|   |                    |
|---|--------------------|
| Total Air Handler Supply Air (based on a 12° TD): | 4,000 CFM          |
| Total Air Handler Vent. Air (37.50% of Supply):   | 1,500 CFM          |
| Total Conditioned Air Space:                      | 1,776 Sq.ft        |
| Supply Air Per Unit Area:                         | 2.2523 CFM/Sq.ft   |
| Area Per Cooling Capacity:                        | 177.6414 Sq.ft/Ton |
| Cooling Capacity Per Area:                        | 0.0056 Tons/Sq.ft  |
| Heating Capacity Per Area:                        | 59.33 Btuh/Sq.ft   |
| Total Heating Required With Outside Air:          | 105,375 Btuh       |
| Total Cooling Required With Outside Air:          | 10.00 Tons         |



### Air Handler #2 - K-1 Kitchen - Summary Loads

| Zn No | Description<br>Zone Peak Time | Area<br>People<br>Volume | Htg Loss<br>Htg CFM<br>CFM/Sqft | Sen Gain<br>Clg CFM<br>CFM/Sqft | Lat Gain<br>S.Exh<br>W.Exh | Htg O.A.<br>Req CFM<br>Act CFM | Clg O.A.<br>Req CFM<br>Act CFM |
|-------|-------------------------------|--------------------------|---------------------------------|---------------------------------|----------------------------|--------------------------------|--------------------------------|
| 9     | Kitchen<br>6pm July           | 650<br>9<br>5,850        | 3,811<br>5,000<br>7.69          | 93,020<br>5,000<br>7.69         | 14,805<br>0<br>0           | Direct<br>1,800<br>1,800       | Direct<br>1,800<br>1,800       |
|       | Zone Peak Totals:             | 650                      | 3,811                           | 93,020                          | 14,805                     |                                |                                |
|       | Total Zones: 1                | 9                        | 5,000                           | 5,000                           | 0                          | 1,800                          | 1,800                          |
|       | Unique Zones: 1               | 5,850                    | 7.69                            | 7.69                            | 0                          | 1,800                          | 1,800                          |



## Air Handler #2 - K-1 Kitchen - Total Load Summary

Air Handler Description: K-1 Kitchen Constant Volume - Proportion  
 Sensible Heat Ratio: 0.86 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time: 5pm in July.  
 Outdoor Conditions: 85° DB, 69° WB, 81.50 grains

Because of the diversity in zone, plenum and ventilation loads, the zone sensible peak time in July at 6pm is different from the total system peak time, hence the air system CFM was computed using a zone sensible load of 93,020.

Summer: Ventilation controls outside air, ---- Winter: Ventilation controls outside air.

|                              |              |              |
|------------------------------|--------------|--------------|
| Zone Space sensible loss:    | 3,811 Btuh   |              |
| Infiltration sensible loss:  | 0 Btuh       | 0 CFM        |
| Outside Air sensible loss:   | 103,468 Btuh | 1,800 CFM    |
| Supply Duct sensible loss:   | 0 Btuh       |              |
| Return Duct sensible loss:   | 0 Btuh       |              |
| Return Plenum sensible loss: | 0 Btuh       |              |
| Total System sensible loss:  |              | 107,279 Btuh |

|   |           |
|---|-----------|
| Heating Supply Air: $3,811 / (.986 \times 1.08 \times 1) =$ | 5,000 CFM |
| Winter Vent Outside Air (36.0% of supply) =                 | 1,800 CFM |

|   |             |             |
|---|-------------|-------------|
| Zone space sensible gain:                   | 93,008 Btuh |             |
| Infiltration sensible gain:                 | 0 Btuh      |             |
| Draw-thru fan sensible gain:                | 0 Btuh      |             |
| Supply duct sensible gain:                  | 0 Btuh      |             |
| Total sensible gain on supply side of coil: |             | 93,008 Btuh |

|  |           |
|--|-----------|
| Cooling Supply Air: $93,020 / (.986 \times 1.1 \times 17) =$ | 5,000 CFM |
| Summer Vent Outside Air (36.0% of supply) =                  | 1,800 CFM |

|   |             |              |
|---|-------------|--------------|
| Return duct sensible gain:                  | 0 Btuh      |              |
| Return plenum sensible gain:                | 0 Btuh      |              |
| Outside air sensible gain:                  | 19,516 Btuh | 1,800 CFM    |
| Blow-thru fan sensible gain:                | 0 Btuh      |              |
| Total sensible gain on return side of coil: |             | 19,516 Btuh  |
| Total sensible gain on air handling system: |             | 112,524 Btuh |

|   |             |              |
|---|-------------|--------------|
| Zone space latent gain:                   | 14,805 Btuh |              |
| Infiltration latent gain:                 | 0 Btuh      |              |
| Outside air latent gain:                  | 19,967 Btuh |              |
| Total latent gain on air handling system: |             | 34,772 Btuh  |
| Total system sensible and latent gain:    |             | 147,296 Btuh |

### Check Figures

|   |                   |
|---|-------------------|
| Total Air Handler Supply Air (based on a 17° TD): | 5,000 CFM         |
| Total Air Handler Vent. Air (36.00% of Supply):   | 1,800 CFM         |
| Total Conditioned Air Space:                      | 650 Sq.ft         |
| Supply Air Per Unit Area:                         | 7.6923 CFM/Sq.ft  |
| Area Per Cooling Capacity:                        | 52.9546 Sq.ft/Ton |
| Cooling Capacity Per Area:                        | 0.0189 Tons/Sq.ft |
| Heating Capacity Per Area:                        | 165.04 Btuh/Sq.ft |
| Total Heating Required With Outside Air:          | 107,279 Btuh      |
| Total Cooling Required With Outside Air:          | 12.27 Tons        |



### Air Handler #3 - K-2 Support Areas - Summary Loads

| Zn No | Description<br>Zone Peak Time | Area<br>People<br>Volume | Htg Loss<br>Htg CFM<br>CFM/Sqft | Sen Gain<br>Clg CFM<br>CFM/Sqft | Lat Gain<br>S Exh<br>W Exh | Htg O/A<br>Req CFM<br>Act CFM | Clg O/A<br>Req CFM<br>Act CFM |
|-------|-------------------------------|--------------------------|---------------------------------|---------------------------------|----------------------------|-------------------------------|-------------------------------|
| 5     | Support<br>6pm July           | 907<br>2<br>9,524        | 5,490<br>787<br>0.87            | 7,836<br>780<br>0.86            | 490<br>0<br>0              | Direct<br>542<br>408          | Direct<br>542<br>405          |
| 6     | Manager's<br>5pm July         | 75<br>0<br>675           | 122<br>17<br>0.23               | 2,272<br>226<br>3.02            | 0<br>0<br>0                | Direct<br>38<br>9             | Direct<br>38<br>117           |
| 7     | Crew<br>10am July             | 99<br>0<br>891           | 1,170<br>168<br>1.70            | 1,485<br>148<br>1.49            | 0<br>0<br>0                | Direct<br>51<br>87            | Direct<br>51<br>77            |
| 8     | Order<br>6pm June             | 135<br>1<br>1,215        | 2,632<br>377<br>2.80            | 1,968<br>196<br>1.45            | 545<br>0<br>0              | Direct<br>69<br>196           | Direct<br>69<br>102           |
|       | Zone Peak Totals:             | 1,216                    | 9,414                           | 13,561                          | 1,035                      |                               |                               |
|       | Total Zones: 4                | 3                        | 1,350                           | 1,350                           | 0                          | 700                           | 700                           |
|       | Unique Zones: 4               | 12,305                   | 1.11                            | 1.11                            | 0                          | 700                           | 700                           |



### Air Handler #3 - K-2 Support Areas - Total Load Summary

Air Handler Description: K-2 Support Areas Constant Volume - Proportion  
 Sensible Heat Ratio: 0.93 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time: 5pm in July.  
 Outdoor Conditions: 85° DB, 69° WB, 81.50 grains

Summer: Ventilation controls outside air, ---- Winter: Ventilation controls outside air.

|                              |             |             |
|------------------------------|-------------|-------------|
| Zone Space sensible loss:    | 9,414 Btuh  |             |
| Infiltration sensible loss:  | 0 Btuh      | 0 CFM       |
| Outside Air sensible loss:   | 40,237 Btuh | 700 CFM     |
| Supply Duct sensible loss:   | 0 Btuh      |             |
| Return Duct sensible loss:   | 0 Btuh      |             |
| Return Plenum sensible loss: | 0 Btuh      |             |
| Total System sensible loss:  |             | 49,651 Btuh |

|   |           |
|---|-----------|
| Heating Supply Air: $9,414 / (.986 \times 1.08 \times 7) =$ | 1,350 CFM |
| Winter Vent Outside Air (51.9% of supply) =                 | 700 CFM   |

|   |             |             |
|---|-------------|-------------|
| Zone space sensible gain:                   | 13,210 Btuh |             |
| Infiltration sensible gain:                 | 0 Btuh      |             |
| Draw-thru fan sensible gain:                | 0 Btuh      |             |
| Supply duct sensible gain:                  | 0 Btuh      |             |
| Total sensible gain on supply side of coil: |             | 13,210 Btuh |

|   |           |
|---|-----------|
| Cooling Supply Air: $13,210 / (.986 \times 1.1 \times 9) =$ | 1,350 CFM |
| Summer Vent Outside Air (51.9% of supply) =                 | 700 CFM   |

|   |            |             |
|---|------------|-------------|
| Return duct sensible gain:                  | 0 Btuh     |             |
| Return plenum sensible gain:                | 0 Btuh     |             |
| Outside air sensible gain:                  | 7,589 Btuh | 700 CFM     |
| Blow-thru fan sensible gain:                | 0 Btuh     |             |
| Total sensible gain on return side of coil: |            | 7,589 Btuh  |
| Total sensible gain on air handling system: |            | 20,800 Btuh |

|   |            |             |
|---|------------|-------------|
| Zone space latent gain:                   | 1,035 Btuh |             |
| Infiltration latent gain:                 | 0 Btuh     |             |
| Outside air latent gain:                  | 7,765 Btuh |             |
| Total latent gain on air handling system: |            | 8,800 Btuh  |
| Total system sensible and latent gain:    |            | 29,600 Btuh |

#### Check Figures

|  |                    |
|--|--------------------|
| Total Air Handler Supply Air (based on a 9° TD): | 1,350 CFM          |
| Total Air Handler Vent. Air (51.85% of Supply):  | 700 CFM            |
| Total Conditioned Air Space:                     | 1,216 Sq.ft        |
| Supply Air Per Unit Area:                        | 1.1102 CFM/Sq.ft   |
| Area Per Cooling Capacity:                       | 492.9799 Sq.ft/Ton |
| Cooling Capacity Per Area:                       | 0.0020 Tons/Sq.ft  |
| Heating Capacity Per Area:                       | 40.83 Btuh/Sq.ft   |
| Total Heating Required With Outside Air:         | 49,651 Btuh        |
| Total Cooling Required With Outside Air:         | 2.47 Tons          |





### Air Handler #4 - P-1 Playplace - Summary Loads

| Zn No | Description<br>Zone Peak Time | Area<br>People<br>Volume | Htg Loss<br>Htg CFM<br>CFM/Sqft | Sen Gain<br>Clg CFM<br>CFM/Sqft | Lat Gain<br>S Exh<br>W Exh | Htg O/A<br>Req CFM<br>Act CFM | Clg O/A<br>Req CFM<br>Act CFM |
|-------|-------------------------------|--------------------------|---------------------------------|---------------------------------|----------------------------|-------------------------------|-------------------------------|
| 1     | Playplace<br>6pm September    | 1,361<br>45<br>23,137    | 30,730<br>3,000<br>2.20         | 48,369<br>3,000<br>2.20         | 18,360<br>0<br>0           | Direct<br>1,000<br>1,000      | Direct<br>1,000<br>1,000      |
|       | Zone Peak Totals:             | 1,361                    | 30,730                          | 48,369                          | 18,360                     |                               |                               |
|       | Total Zones: 1                | 45                       | 3,000                           | 3,000                           | 0                          | 1,000                         | 1,000                         |
|       | Unique Zones: 1               | 23,137                   | 2.20                            | 2.20                            | 0                          | 1,000                         | 1,000                         |



### Air Handler #4 - P-1 Playplace - Total Load Summary

Air Handler Description: P-1 Playplace Constant Volume - Proportion  
 Sensible Heat Ratio: 0.68 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time: 1pm in July.  
 Outdoor Conditions: 85° DB, 69° WB, 81.92 grains

Because of the diversity in zone, plenum and ventilation loads, the zone sensible peak time in September at 6pm is different from the total system peak time, hence the air system CFM was computed using a zone sensible load of 48,369.

Summer: Ventilation controls outside air, ---- Winter: Ventilation controls outside air.

|                              |             |           |             |
|------------------------------|-------------|-----------|-------------|
| Zone Space sensible loss:    | 30,730 Btuh |           |             |
| Infiltration sensible loss:  | 0 Btuh      | 0 CFM     |             |
| Outside Air sensible loss:   | 57,482 Btuh | 1,000 CFM |             |
| Supply Duct sensible loss:   | 0 Btuh      |           |             |
| Return Duct sensible loss:   | 0 Btuh      |           |             |
| Return Plenum sensible loss: | 0 Btuh      |           |             |
| Total System sensible loss:  |             |           | 88,212 Btuh |

|   |           |
|---|-----------|
| Heating Supply Air: $30,730 / (.986 \times 1.08 \times 10) =$ | 3,000 CFM |
| Winter Vent Outside Air (33.3% of supply) =                   | 1,000 CFM |

|   |             |  |             |
|---|-------------|--|-------------|
| Zone space sensible gain:                   | 38,717 Btuh |  |             |
| Infiltration sensible gain:                 | 0 Btuh      |  |             |
| Draw-thru fan sensible gain:                | 0 Btuh      |  |             |
| Supply duct sensible gain:                  | 0 Btuh      |  |             |
| Total sensible gain on supply side of coil: |             |  | 38,717 Btuh |

|  |           |
|--|-----------|
| Cooling Supply Air: $48,369 / (.986 \times 1.1 \times 15) =$ | 3,000 CFM |
| Summer Vent Outside Air (33.3% of supply) =                  | 1,000 CFM |

|   |             |           |             |
|---|-------------|-----------|-------------|
| Return duct sensible gain:                  | 0 Btuh      |           |             |
| Return plenum sensible gain:                | 0 Btuh      |           |             |
| Outside air sensible gain:                  | 10,842 Btuh | 1,000 CFM |             |
| Blow-thru fan sensible gain:                | 0 Btuh      |           |             |
| Total sensible gain on return side of coil: |             |           | 10,842 Btuh |
| Total sensible gain on air handling system: |             |           | 49,559 Btuh |

|   |             |  |             |
|---|-------------|--|-------------|
| Zone space latent gain:                   | 22,950 Btuh |  |             |
| Infiltration latent gain:                 | 0 Btuh      |  |             |
| Outside air latent gain:                  | 11,093 Btuh |  |             |
| Total latent gain on air handling system: |             |  | 34,043 Btuh |
| Total system sensible and latent gain:    |             |  | 83,602 Btuh |

#### Check Figures

|   |                    |
|---|--------------------|
| Total Air Handler Supply Air (based on a 15° TD): | 3,000 CFM          |
| Total Air Handler Vent. Air (33.33% of Supply):   | 1,000 CFM          |
| Total Conditioned Air Space:                      | 1,361 Sq.ft        |
| Supply Air Per Unit Area:                         | 2.2043 CFM/Sq.ft   |
| Area Per Cooling Capacity:                        | 195.3537 Sq.ft/Ton |
| Cooling Capacity Per Area:                        | 0.0051 Tons/Sq.ft  |
| Heating Capacity Per Area:                        | 64.81 Btuh/Sq.ft   |
| Total Heating Required With Outside Air:          | 88,212 Btuh        |
| Total Cooling Required With Outside Air:          | 6.97 Tons          |



**Zone Detailed Loads (At Zone Peak Times)**

| Load Description  | Unit Quan | -SC- CFAC | CLTD SHGF | U.Fac -CLF- | Sen. Gain | Lat. Gain | Htg. Mult. | Htg. Loss |
|---|-----------|-----------|-----------|-------------|-----------|-----------|------------|-----------|
| <b>Zone 1-Playplace peaks (sensible) in September at 6pm, Air Handler 4 (P-1 Playplace), Group 0, 1.0 x 1,361.0, Construction Type: 11 (Medium)</b> |           |           |           |             |           |           |            |           |
| Roof-1-2-Susp.C-L   | 1,361     | 0.50      | 10.2      | 0.030       | 416       |           | 1.620      | 2,205     |
| Wall-1-S-B-M  | 519       | 0.83      | 9.8       | 0.049       | 249       |           | 2.646      | 1,373     |
| Wall-2-W-B-M  | 590       | 0.83      | -2.4      | 0.049       | -71       |           | 2.646      | 1,561     |
| Wall-3-N-B-M  | 400       | 0.83      | -8.4      | 0.049       | -164      |           | 2.646      | 1,058     |
| Wall-4-E-B-M  | 231       | 0.83      | 3.4       | 0.049       | 38        |           | 2.646      | 610       |
| Gls-S-1-90-Tran   | 86.0      | 1.000     | -3        | 0.630       | -163      |           | 34.020     | 2,926     |
| 0%S-1-NS-Solar  | 86.0      | 0.760     | 218       | 0.350       | 4,987     |           |            |           |
| Gls-S-1-90-Tran   | 45.0      | 1.000     | -3        | 0.630       | -85       |           | 34.020     | 1,531     |
| 0%S-4-NS-Solar  | 45.0      | 0.760     | 218       | 0.350       | 2,609     |           |            |           |
| Gls-S-1-90-Tran   | 19.0      | 1.000     | -3        | 0.630       | -36       |           | 34.020     | 646       |
| 0%S-5-NS-Solar  | 19.0      | 0.760     | 218       | 0.350       | 1,102     |           |            |           |
| Gls-W-1-90-Tran   | 195.8     | 1.000     | -3        | 0.630       | -370      |           | 34.020     | 6,662     |
| 4%S-1-NS-Solar  | 195.8     | 0.760     | 193       | 0.550       | 15,799    |           |            |           |
| SGls-W-1-90-Tran  | 8.2       | 1.000     | -3        | 0.630       | -15       |           | 34.020     | 278       |
| 4%S-1-NS-Solar  | 8.2       | 0.760     | 27        | 0.790       | 132       |           |            |           |
| Gls-N-1-90-Tran   | 32.3      | 1.000     | -3        | 0.630       | -61       |           | 34.020     | 1,098     |
| 88%S-1-NS-Solar   | 32.3      | 0.760     | 27        | 0.790       | 523       |           |            |           |
| SGls-N-1-90-Tran  | 236.7     | 1.000     | -3        | 0.630       | -447      |           | 34.020     | 8,053     |
| 88%S-1-NS-Solar   | 236.7     | 0.760     | 27        | 0.790       | 3,837     |           |            |           |
| Lights-Prof=1   | 2,722     | 1.000     |           |             | 9,288     |           |            |           |
| People-Prof=3   | 45.0      | 0.800     |           |             | 10,800    | 18,360    |            |           |
| Floor slab  | 78        |           |           |             |           |           | 35.100     | 2,727     |
| Sub-total   |           |           |           |             | 48,369    | 18,360    |            | 30,730    |
| Safety factors:   |           |           |           |             | +0%       | +0%       |            | +0%       |
| Total w/ safety factors:  |           |           |           |             | 48,369    | 18,360    |            | 30,730    |

|  |     |       |      |       |       |     |        |       |
|--|-----|-------|------|-------|-------|-----|--------|-------|
| <b>Zone 2-Toilet peaks (sensible) in July at 6pm, Air Handler 1 (D-1 Dining &amp; Toilets), Group 0, 1.0 x 138.0, Construction Type: 11 (Medium)</b> |     |       |      |       |       |     |        |       |
| Roof-1-2-Susp.C-L  | 271 | 0.50  | 23.6 | 0.030 | 192   |     | 1.620  | 439   |
| Wall-1-S-B-M   | 243 | 0.83  | 11.8 | 0.049 | 140   |     | 2.646  | 643   |
| Lights-Prof=1  | 276 | 1.000 |      |       | 942   |     |        |       |
| Floor slab   | 18  |       |      |       |       |     | 35.100 | 632   |
| Sub-total  |     |       |      |       | 1,274 | 0   |        | 1,714 |
| Safety factors:  |     |       |      |       | +0%   | +0% |        | +0%   |
| Total w/ safety factors:   |     |       |      |       | 1,274 | 0   |        | 1,714 |

|  |      |       |      |       |       |  |        |     |
|--|------|-------|------|-------|-------|--|--------|-----|
| <b>Zone 3-Vestibule 1 peaks (sensible) in June at 6pm, Air Handler 1 (D-1 Dining &amp; Toilets), Group 0, 1.0 x 42.0, Construction Type: 11 (Medium)</b> |      |       |      |       |       |  |        |     |
| Roof-1-2-Susp.C-L  | 42   | 0.50  | 20.5 | 0.030 | 26    |  | 1.620  | 68  |
| Wall-1-W-B-M   | 41   | 0.83  | 6.3  | 0.049 | 13    |  | 2.646  | 110 |
| Wall-2-N-B-M   | 60   | 0.83  | -0.2 | 0.049 | -1    |  | 2.646  | 159 |
| Gls-W-1-90-Tran  | 14.4 | 1.000 | 1    | 0.630 | 9     |  | 34.020 | 489 |
| 0%S-5-NS-Solar   | 14.4 | 0.760 | 215  | 0.550 | 1,292 |  |        |     |
| Gls-W-1-90-Tran  | 13.8 | 1.000 | 1    | 0.630 | 9     |  | 34.020 | 470 |
| 8%S-4-NS-Solar   | 13.8 | 0.760 | 215  | 0.550 | 1,243 |  |        |     |
| SGls-W-1-90-Tran   | 1.2  | 1.000 | 1    | 0.630 | 1     |  | 34.020 | 41  |



**Zone Detailed Loads (At Zone Peak Times) (cont'd)**

| Load Description         | Unit Quan | -SC- CFAC | CLTD SHGF | U.Fac -CLF- | Sen. Gain | Lat. Gain | Htg. Mult. | Htg. Loss |
|--------------------------|-----------|-----------|-----------|-------------|-----------|-----------|------------|-----------|
| 8%S-4-NS-Solar           | 1.2       | 0.760     | 47        | 0.790       | 34        |           |            |           |
| Gls-W-1-90-Tran          | 3.1       | 1.000     | 1         | 0.630       | 2         |           | 34.020     | 104       |
| 49%S-4-NS-Solar          | 3.1       | 0.760     | 215       | 0.550       | 275       |           |            |           |
| SGls-W-1-90-Tran         | 2.9       | 1.000     | 1         | 0.630       | 2         |           | 34.020     | 100       |
| 49%S-4-NS-Solar          | 2.9       | 0.760     | 47        | 0.790       | 83        |           |            |           |
| Gls-N-1-90-Tran          | 48.0      | 1.000     | 1         | 0.630       | 30        |           | 34.020     | 1,633     |
| 0%S-0-NS-Solar           | 48.0      | 0.760     | 47        | 0.790       | 1,355     |           |            |           |
| Lights-Prof=1            | 84        | 1.000     |           |             | 287       |           |            |           |
| Floor slab               | 15        |           |           |             |           |           | 35.100     | 537       |
| Sub-total                |           |           |           |             | 4,658     | 0         |            | 3,711     |
| Safety factors:          |           |           |           |             | +0%       | +0%       |            | +0%       |
| Total w/ safety factors: |           |           |           |             | 4,658     | 0         |            | 3,711     |

**Zone 4-Vestibule 2 peaks (sensible) in January at 5pm, Air Handler 1 (D-1 Dining & Toilets), Group 0, 1.0 x 45.0, Construction Type: 1 (Light)**

|                          |      |       |       |       |        |     |        |       |
|--------------------------|------|-------|-------|-------|--------|-----|--------|-------|
| Roof-1-2-Susp.C-L        | 45   | 0.50  | -21.7 | 0.030 | -29    |     | 1.620  | 73    |
| Wall-1-S-B-M             | 62   | 0.83  | -19.9 | 0.049 | -61    |     | 2.646  | 165   |
| Gls-S-1-90-Tran          | 57.0 | 1.000 | -28   | 0.630 | -1,005 |     | 34.020 | 1,939 |
| 0%S-1-NS-Solar           | 57.0 | 0.760 | 247   | 0.430 | 4,601  |     |        |       |
| Lights-Prof=1            | 90   | 1.000 |       |       | 307    |     |        |       |
| Floor slab               | 9    |       |       |       |        |     | 35.100 | 316   |
| Sub-total                |      |       |       |       | 3,813  | 0   |        | 2,493 |
| Safety factors:          |      |       |       |       | +0%    | +0% |        | +0%   |
| Total w/ safety factors: |      |       |       |       | 3,813  | 0   |        | 2,493 |

**Zone 5-Support peaks (sensible) in July at 6pm, Air Handler 3 (K-2 Support Areas), Group 0, 1.0 x 907.0, Construction Type: 1 (Light)**

People load based on ASHRAE Ch. 30, Table 1 (P. 30.4) for Sedentary Work: 275 Sens & 275 Latent - Subtract 60 (30 Sens & 30 Latent) for food - Total: 245 Sens & 245 Latent

|                          |       |       |      |       |       |     |        |       |
|--------------------------|-------|-------|------|-------|-------|-----|--------|-------|
| Roof-1-2-Susp.C-L        | 907   | 0.50  | 23.6 | 0.030 | 641   |     | 1.620  | 1,469 |
| Wall-1-S-B-M             | 473   | 0.83  | 11.8 | 0.049 | 273   |     | 2.646  | 1,250 |
| Wall-2-E-B-M             | 324   | 0.83  | 15.3 | 0.049 | 243   |     | 2.646  | 857   |
| Lights-Prof=1            | 1,814 | 1.000 |      |       | 6,190 |     |        |       |
| People-Prof=1            | 2.0   | 1.000 |      |       | 490   | 490 |        |       |
| Floor slab               | 55    |       |      |       |       |     | 35.100 | 1,913 |
| Sub-total                |       |       |      |       | 7,836 | 490 |        | 5,490 |
| Safety factors:          |       |       |      |       | +0%   | +0% |        | +0%   |
| Total w/ safety factors: |       |       |      |       | 7,836 | 490 |        | 5,490 |

**Zone 6-Manager's peaks (sensible) in July at 5pm, Air Handler 3 (K-2 Support Areas), Group 0, 1.0 x 75.0, Construction Type: 1 (Light)**

|                   |     |       |      |       |       |   |       |     |
|-------------------|-----|-------|------|-------|-------|---|-------|-----|
| Roof-1-2-Susp.C-L | 75  | 0.50  | 24.1 | 0.030 | 54    |   | 1.620 | 122 |
| Lights-Prof=1     | 150 | 1.000 |      |       | 512   |   |       |     |
| Equipment-Prof=2  | 500 | 1.000 |      |       | 1,706 | 0 |       |     |
| Sub-total         |     |       |      |       | 2,272 | 0 |       | 122 |



### Zone Detailed Loads (At Zone Peak Times) (cont'd)

| Load Description         | Unit Quan | SC CFAC | CLTD SHGF | U-Fac CLF | Sens Gain | Lat Gain | Htg Mult | Htg Loss |
|--------------------------|-----------|---------|-----------|-----------|-----------|----------|----------|----------|
| Safety factors:          |           |         |           |           | +0%       | +0%      |          | +0%      |
| Total w/ safety factors: |           |         |           |           | 2,272     | 0        |          | 122      |

#### Zone 7 Crew peaks (sensible) in July at 10am Air Handler 3 (K-2 Support Areas) Group 0 11'0" x 99'0" Construction Type: 11 (Light)

|                          |     |       |      |       |       |     |        |       |
|--------------------------|-----|-------|------|-------|-------|-----|--------|-------|
| Roof-1-2-Susp.C-L        | 99  | 0.50  | -0.4 | 0.030 | -1    |     | 1.620  | 160   |
| Wall-1-E-B-M             | 127 | 0.83  | 6.2  | 0.049 | 38    |     | 2.646  | 335   |
| Gls-E-1-90-Tran          | 8.5 | 1.000 | -3   | 0.630 | -16   |     | 34.020 | 289   |
| 0%S-0-NS-Solar           | 8.5 | 0.760 | 214  | 0.570 | 788   |     |        |       |
| Lights-Prof=1            | 198 | 1.000 |      |       | 676   |     |        |       |
| Floor slab               | 11  |       |      |       |       |     | 35.100 | 386   |
| Sub-total                |     |       |      |       | 1,485 | 0   |        | 1,170 |
| Safety factors:          |     |       |      |       | +0%   | +0% |        | +0%   |
| Total w/ safety factors: |     |       |      |       | 1,485 | 0   |        | 1,170 |

#### Zone 8 Order peaks (sensible) in June at 6pm Air Handler 3 (K-2 Support Areas) Group 0 11'0" x 135'0" Construction Type: 11 (Medium)

People load based on ASHRAE Ch. 30, Table 1 (P. 30.4) for Light Dancing: 345 Sens & 545 Latent

|                          |      |       |      |       |       |     |        |       |
|--------------------------|------|-------|------|-------|-------|-----|--------|-------|
| Roof-1-2-Susp.C-L        | 135  | 0.50  | 20.5 | 0.030 | 83    |     | 1.620  | 219   |
| Wall-1-E-B-M             | 140  | 0.83  | 12.1 | 0.049 | 83    |     | 2.646  | 371   |
| Wall-2-N-B-M             | 210  | 0.83  | -0.2 | 0.049 | -2    |     | 2.646  | 554   |
| Gls-N-1-90-Tran          | 20.0 | 1.000 | 1    | 0.630 | 13    |     | 34.020 | 680   |
| 0%S-3-NS-Solar           | 20.0 | 0.760 | 47   | 0.790 | 564   |     |        |       |
| Lights-Prof=1            | 270  | 1.000 |      |       | 921   |     |        |       |
| People-Prof=1            | 1.0  | 1.000 |      |       | 305   | 545 |        |       |
| Floor slab               | 23   |       |      |       |       |     | 35.100 | 807   |
| Sub-total                |      |       |      |       | 1,968 | 545 |        | 2,632 |
| Safety factors:          |      |       |      |       | +0%   | +0% |        | +0%   |
| Total w/ safety factors: |      |       |      |       | 1,968 | 545 |        | 2,632 |

#### Zone 9 Kitchen peaks (sensible) in July at 6pm Air Handler 2 (K-1 Kitchen) Group 0 11'0" x 65'0" Construction Type: 11 (Medium)

People load based on ASHRAE Ch. 30, Table 1 (P. 30.4) for Light Dancing: 345 Sens & 545 Latent

|                          |        |       |      |       |        |        |        |       |
|--------------------------|--------|-------|------|-------|--------|--------|--------|-------|
| Roof-1-2-Susp.C-L        | 650    | 0.50  | 23.6 | 0.030 | 459    |        | 1.620  | 1,053 |
| Wall-2-N-B-M             | 525    | 0.83  | 3.0  | 0.049 | 76     |        | 2.646  | 1,390 |
| Lights-Prof=1            | 1,300  | 1.000 |      |       | 4,436  |        |        |       |
| Equipment-Prof=2         | 25,000 | 1.000 |      |       | 85,304 | 9,900  |        |       |
| People-Prof=1            | 9.0    | 1.000 |      |       | 2,745  | 4,905  |        |       |
| Floor slab               | 39     |       |      |       |        |        | 35.100 | 1,369 |
| Sub-total                |        |       |      |       | 93,020 | 14,805 |        | 3,811 |
| Safety factors:          |        |       |      |       | +0%    | +0%    |        | +0%   |
| Total w/ safety factors: |        |       |      |       | 93,020 | 14,805 |        | 3,811 |



**Zone Detailed Loads (At Zone Peak Times) (cont'd)**

| Load Description | Unit Quan | -SC- CFAC | CLTD SHGF | U-Fac -CLF- | Sen Gain | Lat Gain | Htg Mult | Htg Loss |
|------------------|-----------|-----------|-----------|-------------|----------|----------|----------|----------|
|------------------|-----------|-----------|-----------|-------------|----------|----------|----------|----------|

Zone 10-Dining peaks (sensible) in September at 1pm, Air Handler 1 (D-1 Dining & Toilets), Group 0, 10x11.551-0, Construction Type: 11 (Medium)

|                          |       |       |       |       |        |        |        |        |
|--------------------------|-------|-------|-------|-------|--------|--------|--------|--------|
| Roof-1-2-Susp.C-L        | 1,551 | 0.50  | -0.3  | 0.030 | -15    |        | 1.620  | 2,513  |
| Wall-1-S-B-M             | 256   | 0.83  | 3.2   | 0.049 | 40     |        | 2.646  | 676    |
| Wall-2-N-B-M             | 316   | 0.83  | -10.9 | 0.049 | -168   |        | 2.646  | 837    |
| Gls-S-1-90-Tran          | 136.0 | 1.000 | -3    | 0.630 | -257   |        | 34.020 | 4,627  |
| 0%S-0-NS-Solar           | 136.0 | 0.760 | 218   | 0.570 | 12,844 |        |        |        |
| Gls-N-1-90-Tran          | 20.0  | 1.000 | -3    | 0.630 | -38    |        | 34.020 | 680    |
| 0%S-0-NS-Solar           | 20.0  | 0.760 | 27    | 0.740 | 304    |        |        |        |
| Lights-Prof=1            | 3,102 | 1.000 |       |       | 10,584 |        |        |        |
| People-Prof=3            | 111.0 | 1.000 |       |       | 26,640 | 34,410 |        |        |
| Floor slab               | 54    |       |       |       |        |        | 35.100 | 1,902  |
| Sub-total                |       |       |       |       | 49,934 | 34,410 |        | 11,235 |
| Safety factors:          |       |       |       |       | +0%    | +0%    |        | +0%    |
| Total w/ safety factors: |       |       |       |       | 49,934 | 34,410 |        | 11,235 |

# RESTAURANT DESIGN

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## STRUCTURAL CALCULATIONS

for

45-87/07

W/ PlayPlace

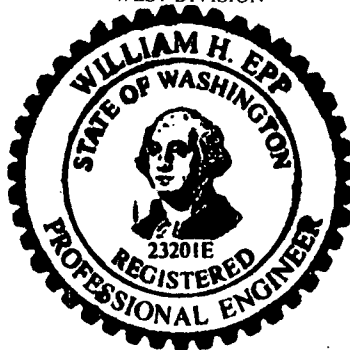
Wood/Wood

Wood Stud Bearing Walls/Wood Joists

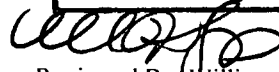
October 19, 2007

15210 PACIFIC HWY. W.  
TUKWILA, WA  
046-0005

WEST DIVISION



EXPIRES 8/21/08



Reviewed By: William H. Epp, P.E.

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DOG-243

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## PROJECT DESIGN CRITERIA

**BUILDING CODE / YEAR:** 2006 International Building Code

**FOUNDATION DESIGN:**

Soil Report Prepared By: The Riley Group, Inc.  
Soil Report Dated: February 27, 2007  
Type of Foundation: concrete  
Soil Bearing Capacity: 2500psf  
Minimum Footing Depth: 18 inches  
Minimum Footing Width: 18 inches  
Special Ordinances:

**LOAD CRITERIA:**

A. Dead Load:  
Roof: 20 psf  
B. Live Load:  
Minimum Roof Load: 25 psf  
Ground Snow Load: 25 psf  
Special Ordinances:  
C. Wind Load:  
Wind Velocity: 90 mph-3S Gust  
Wind Pressure: C  
Wind Importance Factor: 1.0  
Special Ordinances:  
D. Seismic Load:  
Ss / S1: 133.7% / 46.0%  
Fa / Fv: 1.0 / 1.54  
Seismic Occupancy: II  
Seismic Design Category: D  
Site Class: D  
Structural System: Wood Framed Walls (A13)/ Braced  
Frame (B4) / OSMF (C4)  
R: 6.5 / 3.25 / 3.5  
Special Ordinances:

**SERVICEABILITY:**

Dead Load + Live Load: L/240  
Live Load: L/360  
Wind Load: h/400

Conversion Factors:

$$k := 1000 \frac{\text{lb}}{\text{ft}} \quad \text{plf} := \frac{\text{lb}}{\text{ft}} \quad \text{psf} := \frac{\text{lb}}{\text{ft}^2} \quad \text{pcf} := \frac{\text{lb}}{\text{ft}^3} \quad \text{klf} := 1000 \frac{\text{lb}}{\text{ft}} \quad \text{ksf} := 1000 \frac{\text{lb}}{\text{ft}^2} \quad \text{kcf} := 1000 \frac{\text{lb}}{\text{ft}^3} \quad \text{ksi} := 1000 \text{psi}$$

**LOAD ANALYSIS:**

**Building Dimensions:** Lut := 44.42ft LuL := 129.71ft

1. Dead Load:

DLr := 20psf Roof

The actual load is 14 psf: from ASCE 7-02 the insulation is 2.25 psf and the roofing system is 8.4 psf, from the joist manufacturer the joist is 3.375 psf (for a total of 14.025 psf).

2. Live Load:

R1 := 1.0 R2 := 1.0 LL := 20psf

LLr := LL · R1 · R2 LLr = 20 psf Roof

3. Wind Load:

Basic Wind Velocity of 90 mph, 3S gust Exposure C Cf := 1.21

4. Snow Load:

Pg := 25psf Ground Snow Loads

5. Seismic Load:

R := 3.25 IE := 1.0 Fa := 1.0 Ss := 133.7% Fv := 1.54 S1 := 46%  
 Equivalent Lateral Design

Analysis:

**Design Wind Pressure (Method 1 - Enclosed Building):** a1 := min(0.1 · Lut, 0.4 · 18.33ft) a1 = 4.442 ft  
 a := max(a1, 0.04 · LuL) a = 5.188 ft

Horizontal Loads

|          |                       |                 |      |                                      |
|----------|-----------------------|-----------------|------|--------------------------------------|
| End Zone | Interior Zone         |                 |      |                                      |
| Wall     | PA := 12.8 · psf · Cf | PA = 15.488 psf | Wall | PC := 8.5 · psf · Cf PC = 10.285 psf |
| Roof     | PB := -6.7 · psf · Cf | PB = -8.107 psf | Roof | PD := -4.0 · psf · Cf PD = -4.84 psf |

Vertical Loads

|          |                        |                  |          |   |
|----------|------------------------|------------------|----------|---|
| End Zone | Interior Zone          |                  |          |   |
| Windward | PE := -15.4 · psf · Cf | PE = -18.634 psf | Windward | PF := -10.7 · psf · Cf PF = -12.947 psf |
| Leeward  | PG := -8.8 · psf · Cf  | PG = -10.648 psf | Leeward  | PH := -6.8 · psf · Cf PH = -8.228 psf   |

Windward Overhang

End Zone Pu := -21.6 · psf · Cf Pu = -26.136 psf  
 Interior Zone Pu2 := -16.9 · psf · Cf Pu2 = -20.449 psf

Component and Cladding Loads

|      |                         |                    |      |                         |                    |
|------|-------------------------|--------------------|------|-------------------------|--------------------|
| Zone | Zone                    |                    | Zone | Zone                    |                    |
| 1    | P1int := 5.6 · psf · Cf | P1int = 6.776 psf  | 2    | P2int := 5.6 · psf · Cf | P2int = 6.776 psf  |
| 1    | P1ex := -14.2 · psf · C | P1ex = -17.182 psf | 2    | P2ex := -21.8 · psf · C | P2ex = -26.378 psf |

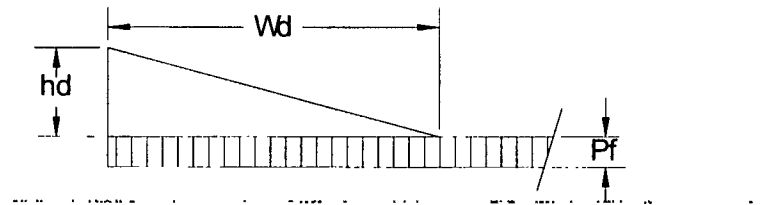
$$Pw := \max \left[ \left( P_A \cdot \frac{a}{LuL} \right) + P_C \cdot \frac{LuL - a}{LuL}, 10 \text{psf} \right] \quad Pw = 10.493 \text{ psf} \quad \text{Wind Load - End \& Interior}$$

$$Pwu := (Pu) \quad Pwu = -26.136 \text{ psf Uplift Wind Load}$$

**Snow Drift:**

$C_e := 0.90$        $C_t := 1.0$        $I_s := 1.0$   
 $h_r := 4.0\text{ft}$       Parapet Height       $Pf1 := 25\text{psf}$   
 Roof Snow Load:  
 $Pf2 := 0.70C_e \cdot C_t \cdot I_s \cdot P_g$        $Pf2 = 15.75\text{ psf}$       ASCE 7, Section 7       $Pf := \max(Pf1, Pf2)$        $Pf = 25\text{ psf}$   
 $\gamma := \frac{0.13}{\text{ft}} \cdot P_g + 14\text{pcf}$        $\gamma = 17.25\text{ pcf}$        $h_b := \frac{Pf}{\gamma}$        $h_b = 1.449\text{ ft}$   
 $h_c := h_r - h_b$        $h_c = 2.551\text{ ft}$        $\frac{h_c}{h_b} = 1.76$        $\frac{h_c}{h_b} \geq 0.20$  Drift must be considered

Height of Drift: conversion factor  $c := \sqrt[3]{\text{ft}} \cdot \sqrt[3]{\text{ft}} \cdot \sqrt[4]{\text{psf}} \cdot \sqrt[4]{\text{psf}} \cdot \sqrt[4]{\text{psf}} \cdot \text{psf}^{-1}$   
 $hdt := \left[ \left( 0.43 \cdot \sqrt[3]{Lut} \cdot \sqrt[4]{P_g + 10\text{psf}} \right) \cdot (c) - 1.5\text{ft} \right] \cdot 0.75$        $hdt = 1.653\text{ ft}$   
 $hdL := \left[ \left( 0.43 \cdot \sqrt[3]{LuL} \cdot \sqrt[4]{P_g + 10\text{psf}} \right) \cdot (c) - 1.5\text{ft} \right] \cdot 0.75$        $hdL = 2.846\text{ ft}$  Governs



Since,  $h_d < h_c$   
 Transverse Direction:  
 $hdt = 1.653\text{ ft}$

Longitudinal Direction:  
 $hdL = 2.846\text{ ft}$

$Wdt := 4 \cdot \frac{hdt}{0.75}$

$Wdt = 8.816\text{ ft}$

$WdL := 4 \cdot \frac{hdL}{0.75}$

$WdL = 15.177\text{ ft}$

$Pdt := \gamma \cdot hdt$

$Pdt = 28.515\text{ psf}$

$PdL := \gamma \cdot hdL$

$PdL = 49.089\text{ psf}$

**Seismic Base Shear: Vs**     $Ww := 20\text{psf}$      $We := 8505\text{lbf}$      $Wo := 4.0\text{ft}$      $hw := 13.33\text{ft}$

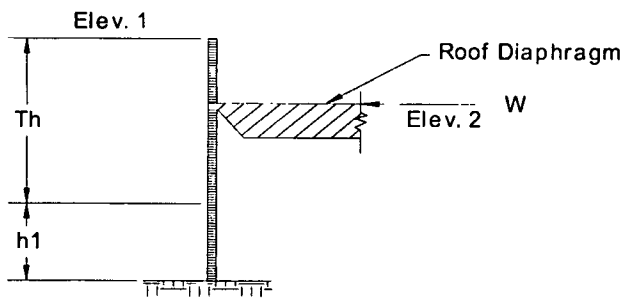
$Sms := Fa \cdot Ss$      $Sms = 1.337$      $Sds := \frac{2}{3} \cdot Sms$      $Sds = 0.891$

$Sm1 := Fv \cdot S1$      $Sm1 = 0.708$      $Sd1 := \frac{2}{3} \cdot Sm1$      $Sd1 = 0.472$

$hn := 18.25$      $Ct := 0.02$      $TL := 6$      $Cu := 1.7$      $Ta := Ct \cdot hn^{0.75}$

$T_{structure} := Cu \cdot Ta$      $T_{structure} = 0.3$      $T_{structure} < T.L$  - Therefore use minimum value

$Cs1 := \frac{Sds \cdot IE}{R}$      $Cs1 = 0.274$      $Cs2 := \frac{Sd1 \cdot IE}{T_{structure} \cdot R}$      $Cs2 = 0.484$      $Cs := \min(Cs1, Cs2)$      $Cs = 0.274$



$LT := LuL + 2 \cdot Wo$      $LT = 137.71 \text{ ft}$

$WT := Lut + 2 \cdot Wo$      $WT = 52.42 \text{ ft}$

$Lx := 32\text{in}$

$Elev\ 1 = 18'3"$      $Th := 11.58\text{ft}$

$Elev\ 2 = 13'4"$

$h1 = 6.67\text{ft}$

$Ar := LuL \cdot Lut$      $Ar = 5761.718 \text{ ft}^2$      $Aw := (Lut + LuL) \cdot 2 \cdot \frac{hw}{2}$      $Aw = 2321.153 \text{ ft}^2$

$Wt := Ar \cdot DLr + Aw \cdot Ww + We$      $Wt = 170.162 \text{ k}$

$QE := Cs \cdot Wt$      $QE = 46.668 \text{ k}$

$Ax := LuL \cdot Lut$      $Ax = 5761.718 \text{ ft}^2$      $r_{max} := \frac{(58.25\text{ft} \cdot 0.5) + (35.1\text{ft} \cdot 0.5)}{LuL}$      $r_{max} = 0.36$

$\rho_{calc} := 2 - \frac{20}{r_{max} \cdot \left(\frac{Ax}{\text{ft}^2}\right)^{0.5}}$      $\rho_{calc} = 1.268$   
 $\rho := \min(\rho_{calc}, 1.5)$      $\rho = 1.268$

$Vs1 := \rho \cdot QE$      $Vs1 = 59.165 \text{ k}$  for foundation design

$Vs := \rho \cdot QE + 0.2Sds \cdot Wt$      $Vs = 89.499 \text{ k}$  for shear wall and braced frame design

**Wind Base Shear (Vw):**

$Awt := Th \cdot Lut$      $Awt = 514.384 \text{ ft}^2$

$AwL := Th \cdot LuL$      $AwL = 1502.042 \text{ ft}^2$

$Vwt := Pw \cdot Awt$      $Vwt = 5.397 \text{ k}$

$VwL := Pw \cdot AwL$      $VwL = 15.761 \text{ k}$      $Vw > Vs$

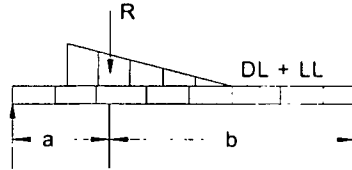
**Therefore, The Seismic Base Shear Governs for the Design:**

**Roof Wood Joist Design:**

Lj := Lut      Sj := 32in

**Design of WJ for DL+LL:**

Lj = 44.42 ft      Sj = 32 in      DLr = 20 psf



DLj := DLr · Sj      DLj = 53.333 plf  
 LLmin := Pf · Sj      LLmin = 66.667 plf      LLmax := (Pdt) · Sj      LLmax = 76.04 plf

$\bar{a} := \frac{Wdt}{3}$       a = 2.939 ft      x := a      b := Lj - a      b = 41.481 ft

Rtr :=  $\frac{LLmax}{2} \cdot Wdt$       Rtr = 0.335 k      Resultant

Wt := LLmin + DLj      Wt = 120 plf

Rmax :=  $\frac{Wt \cdot Lj}{2} + \frac{Rtr \cdot b}{Lj}$       Rmax = 2.978 k      @Left Side

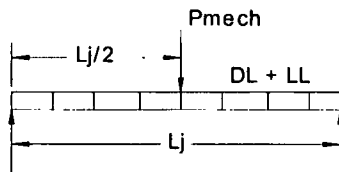
Mmax1 :=  $\frac{Wt \cdot Lj^2}{8} + \frac{Rtr \cdot a \cdot Lj}{2}$       Mmax1 = 30.09 k · ft      @ Center      Governs

Mmax2 :=  $\frac{Wt \cdot x}{2} \cdot (Lj - x) + \frac{Rtr \cdot a \cdot b}{Lj}$       Mmax2 = 8.234 k · ft      @ Point Load

Mmax := max(Mmax1, Mmax2)      Mmax = 30.09 k · ft      Vmax := Rmax      Vmax = 2.978 k

**Design of WJ for DL+LL+ Mechanical Load:**

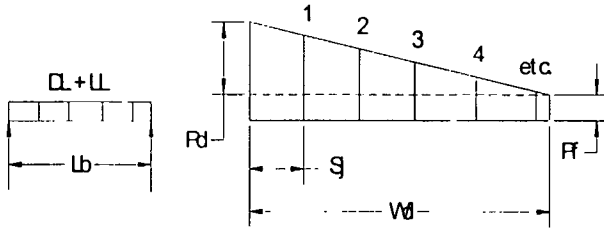
Lj = 44.42 ft      Mmax = 30.09 k · ft      Pmech := 2600lbf



Mmax3 := Mmax +  $\frac{Pmech \cdot (75\%) \cdot Lj}{4}$       Mmax3 = 51.744 k · ft      Vmax3 := Rmax +  $\frac{75\% \cdot Pmech}{2}$       Vmax3 = 3.953 k

**Design of WJ for DL+LL @ Sides of Bldg:**

$L_j = 44.42 \text{ ft}$        $S_j = 32 \text{ in}$        $WdL = 15.177 \text{ ft}$        $PdL = 49.089 \text{ psf}$



**@ Location 1**       $x_m := 1$        $La := WdL - x \cdot S_j$        $La = 150.127 \text{ in}$

$Wta := \left( \frac{PdL}{WdL} \cdot La + Pf + DLr \right) \cdot S_j$        $Wta = 227.904 \text{ plf}$

$M_{max4a} := \frac{Wta \cdot L_j^2}{8}$        $M_{max4a} = 56.211 \text{ k} \cdot \text{ft}$        $V_{max4a} := \frac{Wta \cdot L_j}{2}$        $V_{max4a} = 5.062 \text{ k}$

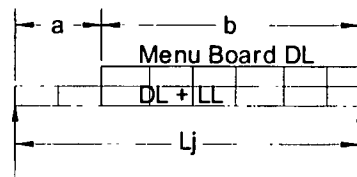
**@ Location 3**       $x_m := 3$        $Lb := WdL - x \cdot S_j$        $Lb = 86.127 \text{ in}$

$Wtb := \left( \frac{PdL}{WdL} \cdot Lb + Pf + DLr \right) \cdot S_j$        $Wtb = 181.904 \text{ plf}$

$M_{max4b} := \frac{Wtb \cdot L_j^2}{8}$        $M_{max4b} = 44.865 \text{ k} \cdot \text{ft}$        $V_{max4b} := \frac{Wtb \cdot L_j}{2}$        $V_{max4b} = 4.04 \text{ k}$

**Design of WJ @ Digital Menu Board Area:**

$P := 1000 \text{ lbf}$        $Lmb := 18 \text{ ft}$        $\frac{W}{Lmb} := \frac{P}{Lmb}$        $W = 55.556 \text{ plf}$



**Computation for Mmax due to Digital Menu Board:**       $L_j = 44.42 \text{ ft}$        $a_m := 5 \text{ ft}$        $b_m := Lmb - a$        $b = 13 \text{ ft}$

**WITHOUT X-BRACING**       $\frac{Wt}{Lmb} := W \cdot \frac{2}{3}$        $Wt = 37.037 \text{ plf}$

$RL := \frac{Wt \cdot \frac{b^2}{2}}{L_j}$        $RL = 0.07 \text{ k}$        $RR := \frac{Wt \cdot (b) \cdot \left( \frac{b}{2} + a \right)}{L_j}$        $RR = 0.125 \text{ k}$

$x_m := \frac{L_j \cdot RL}{RR + RL}$        $x = 16.041 \text{ ft}$        $M_{max5} := RL \cdot a + RL \cdot \frac{x}{2}$        $M_{max5} = 0.917 \text{ k} \cdot \text{ft}$

WITH X- BRACING @ 4 TRUSS JOISTS n := 4  $Wt := \frac{W}{n}$  Wt = 13.889 plf

$$RLx := \frac{Wt \cdot \frac{b^2}{2}}{Lj} \quad RLx = 0.026 \text{ k} \quad RRx := \frac{Wt \cdot (b) \cdot \left(\frac{b}{2} + a\right)}{Lj} \quad RRx = 0.047 \text{ k}$$

$$x := \frac{Lj \cdot RL}{RRx + RLx} \quad x = 42.775 \text{ ft} \quad Mmax5x := RLx \cdot a + RLx \cdot \frac{x}{2} \quad Mmax5x = 0.697 \text{ k} \cdot \text{ft}$$

Mmax = 30.09 k · ft      Vmax = 2.978 k

Without X-Braces

With X-Braces

Mmax5a := Mmax + Mmax5    Mmax5a = 31.007 k · ft    Mmax5b := Mmax + Mmax5: Mmax5b = 30.787 k · ft  
 Vmax5a := Vmax + RR      Vmax5a = 3.103 k      Vmax5b := Vmax + RRx      Vmax5b = 3.025 k

**Summary of Design Shear and Moments:**

|                        |                  |   |
|------------------------|------------------|---|
| Mmax = 30.09 k · ft    | Vmax = 2.978 k   | DL + LL                                       |
| Mmax3 = 51.744 k · ft  | Vmax3 = 3.953 k  | DL + LL + MECHANICAL                          |
| Mmax4a = 56.211 k · ft | Vmax4a = 5.062 k | DL + LL + SNOW DRIFT @ 1                      |
| Mmax4b = 44.865 k · ft | Vmax4b = 4.04 k  | DL + LL + SNOW DRIFT @ n                      |
| Mmax5a = 31.007 k · ft | Vmax5a = 3.103 k | DL + LL + DIGITAL MENU BOARD WITHOUT X-BRACES |
| Mmax5b = 30.787 k · ft | Vmax5b = 3.025 k | DL + LL + DIGITAL MENU BOARD WITH X-BRACES    |

Using: 28" TJS : Depth = 28"      Lj = 44.42 ft    Wallow := 165plf  
 Manufacturer's Design Properties :

$$Mrallow := \left( \frac{Wallow \cdot Lj^2}{8} \right) \quad Mrallow = 40.696 \text{ k} \cdot \text{ft} \quad Vallow := \left( \frac{Wallow \cdot Lj}{2} \right) \quad Vallow = 3.665 \text{ k}$$

**Summary:**

| Load Combo / Locations | Moments (k · ft) | Shear (k) | Joist Descriptions | Length (ft) | Depth (Inch) | n | Capacity (k · ft) | REMARKS |
|------------------------|------------------|-----------|--------------------|-------------|--------------|---|-------------------|---------|
| DL+LL                  | 30.09            | 2.98      | TJS 28/37/28       | 44.52       | 28"          | 1 | 40.696            |         |
| Mechanical             | 51744            | 3.95      | TJS 28/37/28       | 44.08       | 28"          | 2 | 81392             |         |
| Location 1             | 56.211           | 5.06      | TJS 28/37/28       | 44.08       | 28"          | 2 | 81392             |         |
| Location 3             | 44.865           | 4.04      | TJS 28/37/28       | 44.08       | 28"          | 2 | 81392             |         |
| Menu Board             | 31007            | 3.1       | TJS 28/37/28       | 44.08       | 28"          | 1 | 40.696            |         |

**Header "H1"**  $h_{pwall} := 11\text{ft}$   $DL_{wall} := 20\text{psf}$   $W := P_g + LL_r$   $W = 45\text{psf}$

$$T_W := \frac{L_{ut}}{2} + W_o \quad \text{Span} := 4.33\text{ft}$$

$$V_{h1} := \frac{(W \cdot T_W + DL_{wall} \cdot 4.67\text{ft}) \cdot \text{Span}}{2} \quad V_{h1} = 2.756\text{ k}$$

$$M_{h1} := \frac{(W \cdot T_W + DL_{wall} \cdot 4.67\text{ft}) \cdot \text{Span}^2}{8} \quad M_{h1} = 2.983\text{ k} \cdot \text{ft}$$

Use 3-1 3/4" x 5 1/2" LVL for Header 1:  $M_{cap} := 6.375\text{k} \cdot \text{ft}$   $V_{cap} := 5.49\text{k}$

Result := if( $M_{cap} \geq M_{h1}$ , "OK", "not OK") Result = "OK"

Douglas Fir-Larch No.1:  $n_{hs} := 2$   $d_{sup} := n_{hs} \cdot 1.5\text{in}$   $d_{sup} = 3\text{in}$   $L_e := 7.33\text{ft}$   $b_h := 5.25\text{in}$

$F_c := 1000\text{psi}$   $K_{cE} := 0.30$   $\phi_c := 0.80$   $C_{plus} := 1.25$   $E := 1.6(10^6)\text{psi}$

$$F_{cE} := \frac{K_{cE} \cdot E}{\left(\frac{L_e}{d_{sup}}\right)^2} \quad F_{cE} = 558.359\text{ psi} \quad F_C := C_{plus} \cdot F_c \quad F_C = 1.25\text{ ksi}$$

$$C_p := F_C \cdot \left[ \frac{1 + \frac{F_{cE}}{F_C}}{2 \cdot c} - \sqrt{\left( \frac{1 + \frac{F_{cE}}{F_C}}{2 \cdot c} \right)^2 - \frac{F_{cE}}{F_C}} \right] \quad C_p = 493.851\text{ psi} \quad P_a := C_p \cdot (n_{hs} \cdot d_{sup}) \cdot b_h \quad P_a = 15.556\text{ k}$$

Result := if( $P_a \geq V_{h1}$ , "SAFE", "not SAFE") Result = "SAFE"

Check Bearing  $Sup_{cap} := 10\text{k}$  for 5 1/2" x LVL - 2 3/4" bearing required

Requirements:

Result := if( $Sup_{cap} \geq V_{h1}$ , "SAFE", "not SAFE") Result = "SAFE"

Use 2 - Crippled 2x6 Studs for Support of H-1



**Header "H2"**

Span := 8ft  $T_W := \frac{L_{ut}}{2} + W_o$   $T_W = 26.21$  ft  $DL_{wall} := 20$ psf

$V_{h2} := \frac{(W \cdot T_W + DL_{wall} \cdot 11ft) \cdot Span}{2}$   $V_{h2} = 5.598$  k

$M_{h2} := \frac{(W \cdot T_W + DL_{wall} \cdot 11ft) \cdot Span^2}{8}$   $M_{h2} = 11.196$  k·ft

Use 1-5 1/4" x 9 1/4" PSL for Header 2:  $M_{cap} := 18.625$  k·ft  $V_{cap} := 9.39$  k

$Result := if(M_{cap} \geq M_{h2}, "OK", "not OK")$  Result = "OK"

Douglas Fir-Larch No.1:  $n_{hs} := 2$   $d_{sup} := n_{hs} \cdot 1.5$ in  $d_{sup} = 3$ in  $L_e := 7.33$ ft  $b_h := 5.25$ in

$F_c := 1000$ psi  $K_{CE} := 0.30$   $c := 0.80$   $C_{plus} := 1.25$   $E := 1.6(10^6)$ psi

$F_{cE} := \frac{K_{CE} \cdot E}{\left(\frac{L_e}{d_{sup}}\right)^2}$   $F_{cE} = 558.359$  psi  $F_C := C_{plus} \cdot F_c$   $F_C = 1.25$  ksi

$C_p := F_C \cdot \left[ \frac{1 + \frac{F_{cE}}{F_C}}{2 \cdot c} - \sqrt{\left( \frac{1 + \frac{F_{cE}}{F_C}}{2 \cdot c} \right)^2 - \frac{F_{cE}}{F_C}} \right]$   $C_p = 493.851$  psi  $P_a := C_p \cdot (n_{hs} \cdot d_{sup}) \cdot b_h$   $P_a = 15.556$  k

$Result := if(P_a \geq V_{h2}, "SAFE", "not SAFE")$  Result = "SAFE"

Check Bearing Requirements:

$Sup_{cap} := 10$  k for 5 1/4" x PSL - 2 3/4" bearing required

$Result := if(Sup_{cap} \geq V_{h2}, "SAFE", "not SAFE")$  Result = "SAFE"

Use 2 - Crippled 2x6 Studs for Support of H-2

**Header "H3"**

$L_{h3} := 8.17\text{ft}$   $f_y := 50\text{ksi}$

$T_W := 2.67\text{ ft}$   $T_W = 2.67\text{ ft}$   $W = 45\text{ psf}$

$V_{h3} := \frac{(W \cdot T_W + DL_{wall} \cdot 10\text{ft}) \cdot L_{h3}}{2}$   $V_{h3} = 1.308\text{ k}$

$M_{h3} := \frac{(W \cdot T_W + DL_{wall} \cdot 10\text{ft}) \cdot L_{h3}^2}{8}$   $M_{h3} = 2.671\text{ k} \cdot \text{ft}$

Try 2-6" x 18GA Joists for Header 3:

$S_{xl} := \frac{M_{h3}}{0.66 \cdot f_y}$   $S_{xl} = 0.971\text{ in}^3$  Try 2- 6" CSJ, 18 GA  $S_x := 1.544\text{ in}^3$

Check for Deflection:  $E := 29000\text{ksi}$   $I := 4.632\text{in}^4$

$\Delta_{max} := \frac{5(W \cdot T_W) \cdot L_{h3}^4}{384E \cdot I}$   $\Delta_{max} = 0.09\text{ in}$   $\Delta_{allow} := \frac{L_{h3}}{240}$   $\Delta_{allow} = 0.409\text{ in}$  OR  $\Delta_{allow} := 1\text{ in}$

Use 2-6" CSJ, 18 GA, A50 for Header 3

**Beam "B1"**

Simple Beam  $f_y := 36\text{ksi}$   $Span := 16.458\text{ft}$

$T_W := \frac{L_{ut}}{2}$   $T_W = 22.21\text{ ft}$

$W := P_g + LL_r$   $W = 45\text{ psf}$   $W_{btf} := W \cdot T_W$   $W_{btf} = 999.45\text{ plf}$

$R_{btf} := \frac{W_{btf} \cdot Span}{2}$   $R_{btf} = 8.224\text{ k}$   $M_{btf} := \frac{W_{btf} \cdot Span^2}{8}$   $M_{btf} = 33.84\text{ k} \cdot \text{ft}$

$S_{xtf} := \frac{M_{btf}}{0.60 \cdot f_y}$   $S_{xtf} = 18.8\text{ in}^3$  Try W16 x 26, A36  $S_x := 38.4\text{ in}^3$

Check for Deflection:  $E := 29000\text{ksi}$   $I := 301\text{in}^4$

$\Delta_{max} := \frac{5W_{btf} \cdot Span^4}{384E \cdot I}$   $\Delta_{max} = 0.189\text{ in}$   $\Delta_{allow} := \frac{Span}{240}$   $\Delta_{allow} = 0.823\text{ in}$  OR  $\Delta_{allow} := 1.0\text{ in}$

Use W16 x 26, A36 for Beam - "B1"

**Beam: "B2"**

$$L_{bts} := 8.17 \text{ ft} \quad \underline{TW} := \frac{L_j}{2} \quad TW = 22.21 \text{ ft}$$

$$\underline{W} := P_g + LL_r \quad W = 45 \text{ psf} \quad \underline{Wbts} := W \cdot TW \quad Wbts = 999.45 \text{ plf}$$

$$\underline{Rbts} := \frac{Wbts \cdot L_{bts}}{2} \quad Rbts = 4.083 \text{ k} \quad \underline{Mbts} := \frac{Wbts \cdot L_{bts}^2}{8} \quad Mbts = 8.339 \text{ k} \cdot \text{ft}$$

$$\underline{Sxts} := \frac{Mbts}{0.60 \cdot f_y} \quad Sxts = 4.633 \text{ in}^3 \quad \text{Try W16 x 26, A36} \quad \underline{S_x} := 38.40 \text{ in}^3$$

Check for Deflection:  $\underline{E} := 29000 \text{ ksi} \quad \underline{I} := 301 \text{ in}^4$

$$\underline{\Delta_{max}} := \frac{5Wbts \cdot L_{bts}^4}{384E \cdot I} \quad \Delta_{max} = 0.011 \text{ in} \quad \underline{\Delta_{allow}} := \frac{L_{bts}}{240} \quad \Delta_{allow} = 0.409 \text{ in OR } \underline{\Delta_{allow}} := 1.0 \text{ in}$$

Use W16 x 26, A36 for "B2"

**Beam: "B3"**

$$\underline{L_{bts}} := 16.458 \text{ ft}$$

$$\underline{TW} := \frac{5.896 \text{ ft}}{2} \quad TW = 2.948 \text{ ft} \quad \underline{W} := P_g + LL_r \quad W = 45 \text{ psf} \quad \underline{Wbts} := W \cdot TW \quad Wbts = 132.66 \text{ plf}$$

$$\underline{Rbts} := \frac{Wbts \cdot L_{bts}}{2} \quad Rbts = 1.092 \text{ k} \quad \underline{Mbts} := \frac{Wbts \cdot L_{bts}^2}{8} \quad Mbts = 4.492 \text{ k} \cdot \text{ft}$$

$$\underline{Sxts} := \frac{Mbts}{0.60 \cdot f_y} \quad Sxts = 2.495 \text{ in}^3 \quad \text{Try W10 x 12, A36} \quad \underline{S_x} := 10.9 \text{ in}^3$$

Check for Deflection:  $\underline{E} := 29000 \text{ ksi} \quad \underline{I} := 53.8 \text{ in}^4$

$$\underline{\Delta_{max}} := \frac{5Wbts \cdot L_{bts}^4}{384E \cdot I} \quad \Delta_{max} = 0.14 \text{ in} \quad \underline{\Delta_{allow}} := \frac{L_{bts}}{240} \quad \Delta_{allow} = 0.823 \text{ in OR } \underline{\Delta_{allow}} := 1.0 \text{ in}$$

Use W10 x 12, A36 for Beam "B3"

**Beam = "B4"** Simple Beam  $f_{yy} := 46\text{ksi}$   $\text{Span} := 26.58\text{ft}$

$$\text{TW} := \frac{L_{ut}}{2} = 6\text{ft} + 4\text{ft} \quad \text{TW} = 20.21 \text{ ft}$$

$$W := P_g + LL_r \quad W = 45 \text{ psf} \quad \text{Wbtf} := W \cdot \text{TW} \quad \text{Wbtf} = 909.45 \text{ plf}$$

$$\text{Rbtf} := \frac{\text{Wbtf} \cdot \text{Span}}{2} \quad \text{Rbtf} = 12.087 \text{ k} \quad \text{Mbtf} := \frac{\text{Wbtf} \cdot \text{Span}^2}{8} \quad \text{Mbtf} = 80.315 \text{ k} \cdot \text{ft}$$

$$\text{Sxts} := \frac{\text{Mbtf}}{0.60 \cdot f_y} \quad \text{Sxts} = 44.62 \text{ in}^3 \quad \text{Try TS16x4x1/2, A36} \quad \text{S}_x := 60.2 \text{ in}^3$$

$$\text{S}_y := 24.6 \text{ in}^3$$

$$\text{Syts} := \frac{\text{Span} \cdot W \cdot (4\text{ft})^2}{0.60 \cdot f_y} \quad \text{Syts} = 10.632 \text{ in}^3$$

Check for Deflection:  $E := 29000\text{ksi}$   $I_x := 481\text{in}^4$   $I_y := 49.3\text{in}^4$

$$\Delta_{\text{max}} := \frac{5 \cdot \text{Wbtf} \cdot \text{Span}^4}{384 \cdot E \cdot I} + \frac{W \cdot \text{Span} \cdot (4\text{ft})^4}{8 \cdot E \cdot I_y} \quad \Delta_{\text{max}} = 0.778 \text{ in}$$

$$\Delta_{\text{allow}} := \frac{\text{Span}}{240} \quad \Delta_{\text{allow}} = 1.329 \text{ in OR } \Delta_{\text{allow}} := 1.0 \text{ in}$$

Use TS16x4x1/2, A36 for Beam - "B4"

### Column Design (Typ):

**Typical Interior Column:**  $K_c := 1.0$   $L_c := 12\text{ft}$   $K \cdot L_c = 12\text{ft}$   
 $L_e := \frac{L_{ut}}{2} - \frac{6\text{ft}}{2}$   $L_e = 19.21\text{ft}$   $W_e := \frac{16.458\text{ft} + 8.17\text{ft}}{2}$   $W_e = 12.314\text{ft}$   
 $W_c := P_g + LL_r$   $W_c = 45\text{psf}$   $P_{ci} := W_c \cdot (L_e \cdot W_e)$   $P_{ci} = 10.645\text{k}$   
 Use TS 4" x 4" x 1/4",  $f_y = 46\text{ksi}$   $P_{callow} := 55.0\text{k}$

**Typical Exterior Column:**  $K_c := 1.0$   $L_c := 12\text{ft}$   $K \cdot L_c = 12\text{ft}$   
 $L_e := \frac{L_{ut}}{2} + W_o - 6\text{ft}$   $L_e = 20.21\text{ft}$   $W_e := \frac{26.58\text{ft}}{2}$   $W_e = 13.29\text{ft}$   
 $W_c := P_g + LL_r$   $W_c = 45\text{psf}$   $P_{ce} := W_c \cdot (L_e \cdot W_e)$   $P_{ce} = 12.087\text{k}$   
 Use TS 4" x 4" x 1/4",  $f_y = 46\text{ksi}$   $P_{callow} := 55.0\text{k}$

### Footing Design:

**Typical Interior Footing:**  $SBC := 2500\text{psf}$   
 $P_{ce} = 12.087\text{k}$   $SBC = 2.5\text{ksf}$   
 $A_{req} := \frac{P_{ci}}{SBC}$   $A_{req} = 4.258\text{ft}^2$   $S := \sqrt{A_{req}}$   $S = 2.063\text{ft}$  say  $S := 3\text{ft}$   
 Enter the Table Provided:  
 Use 3'0" x 3'0" x 1'0" with 4 - #5 E.W.B for Interior Footing

**Typical Exterior Footing:**  $SBC := 2500\text{psf}$   
 $P_{ce} = 12.087\text{k}$   $SBC = 2.5\text{ksf}$   
 $A_{req} := \frac{P_{ce}}{SBC}$   $A_{req} = 4.835\text{ft}^2$   $S := \sqrt{A_{req}}$   $S = 2.199\text{ft}$  say  $S := 3\text{ft}$   
 Enter the Table Provided:  
 Use 3'0" x 3'0" x 1'0" with 4 - #5 E.W.B for Exterior Footing



**Shear Wall A:**

$LsA = 26.67 \text{ ft}$

$V3 = 37.239 \text{ k}$

$v3a := \frac{V3}{LsA}$

$v3a = 1396.287 \text{ plf}$

Anchor Bolts:  $5/8" \phi$   $v_{allow} := 1170 \text{ lbf}$

$S3a := \frac{v_{allow}}{v3a}$   $S3a = 10.055 \text{ in}$

Stability Checking:

$Pdl := 0.01 \text{ ksf} \cdot LsA \cdot h$   $Pdl = 3.555 \text{ k}$

$Mot := V3 \cdot hs$

$Mot = 496.395 \text{ ft k}$

$Mres := Pdl \cdot \frac{LsA}{2}$   $Mres = 47.407 \text{ k} \cdot \text{ft}$

$Ta := \frac{Mot}{(LsA - ft) \cdot 0.75}$   $Ta = 25.783 \text{ k}$

**Shear Wall B:**

$LsB = 26.02 \text{ ft}$

$V1 = 21.88 \text{ k}$

$v1b := \frac{V1}{LsB}$

$v1b = 840.88 \text{ plf}$

$S1b := \frac{v_{allow}}{v1b}$   $S1b = 16.697 \text{ in}$

Stability Checking:

$Pdl := 0.01 \text{ ksf} \cdot LsB \cdot hs$   $Pdl = 3.468 \text{ k}$

$Mot := V1 \cdot hs$

$Mot = 291.656 \text{ ft k}$

$Mres := Pdl \cdot \frac{LsB}{2}$   $Mres = 45.125 \text{ k} \cdot \text{ft}$

$Tb := \frac{Mot}{(LsB - ft) \cdot 0.75}$   $Tb = 15.543 \text{ k}$

**Shear Wall C:**

$LsC = 40.33 \text{ ft}$

$V3 = 37.239 \text{ k}$

$v3c := \frac{V3}{LsC}$

$v3c = 923.356 \text{ plf}$

$S3c := \frac{v_{allow}}{v3c}$   $S3c = 15.205 \text{ in}$

Stability Checking:

$Pdl := 0.01 \text{ ksf} \cdot LsC \cdot hs$   $Pdl = 5.376 \text{ k}$

$Mot := V3 \cdot hs$

$Mot = 496.395 \text{ ft k}$

$Mres := Pdl \cdot \frac{LsC}{2}$   $Mres = 108.407 \text{ k} \cdot \text{ft}$

$Tc := \frac{Mot}{(LsC - ft) \cdot 0.75}$   $Tc = 16.828 \text{ k}$

$Va := V1$

$Va = 21.88 \text{ k}$

$Vb := V1$

$Vb = 21.88 \text{ k}$

$v4a := \frac{Va}{Lut}$

$v4a = 492.564 \text{ plf}$

$v4b := \frac{Vb}{Lut}$

$v4b = 492.564 \text{ plf}$

**Summary of Design Loads:**

Roof Diaphragm:

v4a = 492.564 plf      v4b = 492.564 plf

Shear Wall - A

v3a = 1396.287 plf      Ta = 25.783 k      S3a = 10.055 in

Shear Wall - B

v1b = 840.88 plf      Tb = 15.543 k      S1b = 16.697 in

Shear Wall - C

v3c = 923.356 plf      Tc = 16.828 k      S3c = 15.205 in

**Summary:** Using Simplified Design Data Sheets:

| Sheathing (in) | NAILS/ Spacing | Capacity (plf) | HOLDOWNS @ Ends | SW | Capacity (lbf) | Spacing A. Bolts | REMARKS        |
|----------------|----------------|----------------|-----------------|----|----------------|------------------|----------------|
| 1-9/32"        | 10d@6"         | 320            | N/A             |    |                | N/A              |                |
| 2-5/32"        | 10d @2"        | 2*770          | 2-FD16-W 11/4d  |    | 2*880          | 8"               | Min Emb. Of 8" |
| 2-5/32"        | 10d @4"        | 2*460          | 2-FD10A-W 7/8d  |    | 2*995          | 6"               | Min Emb. Of 8" |
| 2-5/32"        | 10d @3"        | 2*600          | 2-FD10A-W 7/8d  |    | 2*995          | 4"               | Min Emb. Of 8" |

See sheet S2.0 for additional nailing requirements for roof diaphragm  $R_{moment} := 3.5 R_{shear} := 6.5$   
 Note: Shearwalls have 4 total holdowns and therefore are adequate

Check Splice Plate:

$V_{splice} := V3 \cdot R_{eff}$

$$R_{eff} := \frac{R_{shear}}{R_{moment} + R_{shear}}$$

$V_{splice} = 24.205 \text{ k}$

Use 3/4" diameter bolts with 1/4" plate into 4x6 top plate

$Z_{bolt} := 1.57 \text{ k}$      $C_d := 1.15$      $C_m := 1$      $C_t := 1$      $C_g := 0.83$      $C_{delta} := 1$

$P_{bolt} := Z_{bolt} \cdot C_d \cdot C_m \cdot C_t \cdot C_g \cdot C_{delta}$      $P_{bolt} = 1.499 \text{ k}$

No. of Bolts Req'd:  $No_{req} := \frac{V_{splice}}{P_{bolt}}$      $No_{req} = 16.152$     Use 18-3/4" diameter bolts

**Design of Ledger @ Rear Wall:**

$P_{wall} := V1$      $P = 21.88 \text{ k}$

Provide 2"x10" Ledger, SPF #2     $nl := 2$     no. of ledger

$A_{wall} := 1.5 \text{ in} \cdot 9.25 \text{ in}$      $A = 13.875 \text{ in}^2$

$F_t := 425 \text{ psi} \cdot (1.6) \cdot (1.2) \cdot (nl)$      $F_t = 1.632 \text{ ksi}$      $fT := \frac{P}{A}$      $fT = 1.577 \text{ ksi}$      $F_t > fT$     OK

Therefore: Use 2 - 2"x 10" Ledger, SPF #2

Using 1-3/8" φ Lag Screws @ 16" o.c.:

$Cap := 370 \text{ lbf} \cdot 1.6$      $Cap = 0.592 \text{ k}$

$Nb := \frac{P}{Cap}$      $Nb = 36.959$     no. of bolts    say     $Nb := 37$

$Sb := \frac{L_{ul}}{Nb}$      $Sb = 14.406 \text{ in}$     bolt spacing    say     $Sb := 12 \text{ in}$

Therefore: Use 1-3/8" φ Lag Screws @ 12" o.c.



### Braced Frame Design

$$P_k := V_6 \quad P_k = 37.239 \text{ k} \quad L_{cc} := 5.67 \text{ ft} \quad \underline{H_1} := 7.25 \text{ ft} \quad H_t := H_1 \cdot 2 \quad H_t = 14.5 \text{ ft}$$

$$P_d := P_k \cdot \frac{(L_{cc}^2 + H_1^2)^{0.5}}{H_1} \quad P_d = 47.275 \text{ k} \quad (L_{cc}^2 + H_1^2)^{0.5} = 9.204 \text{ ft} \quad 9 \text{ ft } 2 \frac{1}{2} \text{ in is length of diagonal}$$

$$P_{ver} := \frac{P_k \cdot H_1}{L_{cc}} \quad P_{ver} = 47.616 \text{ k at 7 feet 3 inches} \quad P_h := P_k \quad P_h = 37.239 \text{ k}$$

$$P_{vermax} := P_{ver} \quad P_{vermax} = 47.616 \text{ k at 7 feet 3 inches} \quad P_k = 37.239 \text{ k at 5 feet 8 inches}$$

$$\phi_c := 0.85 \quad A_{ts} := 5.08 \text{ in}^2 \quad r := 1.45 \text{ in} \quad k_{ts} := 1.2$$

$$\frac{k_{ts} \cdot L_{cc}}{r} = 56.309 \quad f_{bk} := 17.71 \text{ ksi} \quad \frac{k_{ts} \cdot H_1}{r} = 72 \quad f_{bvm} := 16.22 \text{ ksi}$$

$$P_k := 0.8 \cdot \phi_c \cdot 1.7 \cdot f_{bk} \cdot A_{ts} \quad P_k = 104.002 \text{ k} \quad P_{vm} := 0.8 \cdot \phi_c \cdot 1.7 \cdot f_{bvm} \cdot A_{ts} \quad P_{vm} = 95.252 \text{ k}$$

$$\frac{k_{ts} \cdot 8.45 \text{ ft}}{r} = 83.917 \quad f_{bd} := 14.9 \text{ ksi} \quad P_d := 0.8 \cdot \phi_c \cdot 1.7 \cdot f_{bd} \cdot A_{ts} \quad P_d = 87.5 \text{ k}$$

P<sub>max</sub> is equal to 104k at 5'-8", 95.3k at 7'-3" and 87.5k at 9'-2 1/2" for TS4x4x3/8

Tube Steel members are adequate.

Check welded connections:

$$D := 4 \text{ in} \quad t := 0.375 \text{ in} \quad Q_f := 1 \quad \sigma_y := 36 \text{ ksi}$$

$$\tau := \frac{\sigma_y \cdot Q_f}{0.6 \cdot \left(\frac{D}{2 \cdot t}\right)} \quad \tau = 11.25 \text{ ksi}$$

$$L_{weld} := 12 \text{ in} \quad \phi_w := 0.80 \quad f_w := t \cdot \tau$$

$$P_w := L_{weld} \cdot \phi_w \cdot f_w \cdot 1.7 \quad P_w = 68.85 \text{ k} \quad P_w > P_d \quad \text{Weld is adequate.}$$

**Design of Drag Strut**

$V_h := V_1 \quad V_h = 21.88 \text{ k}$

Provide (2) - 3 1/2" x 9 1/2" LSL  $n := 2$  no. of beams

$A_w := (3.5 \text{ in} \cdot 9.5 \text{ in} \cdot n)$

$A = 66.5 \text{ in}^2$

$F_v := 400 \text{ psi} \cdot 1.6 \cdot 1 \cdot 1$

$F_v = 0.64 \text{ ksi} \quad f_v := \frac{3 \cdot V_h}{2A} \quad f_v = 0.494 \text{ ksi} \quad F_v > f_v$

Therefore: Use (2) - 3 1/2" x 9 1/2" LSL

OK

Using 1-5/8"  $\phi$  Lag Screws @ 3" o.c.:  $Cap := 1140 \text{ lbf} \cdot 1.6 \cdot 1 \cdot 1 \cdot 1 \cdot \left(\frac{5}{5}\right) \cdot 1 \quad Cap = 1.824 \text{ k}$

$N_b := \frac{V_h}{Cap} \quad N_b = 11.995 \text{ no. of bolts} \quad \text{say} \quad N_b := 12$

Therefore: Use 12-5/8"  $\phi$  x 7" Lag Screws @ 3" o.c.

Check 1-1/4"  $\phi$  x 6" Wood Screws @ 6" o.c.:  $Cap := 220 \cdot \text{lbf} \cdot 1.6 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \quad Cap = 0.352 \text{ k}$

$N_b := \frac{V_h}{Cap} \quad N_b = 62.158 \text{ no. of screws} \quad \text{say} \quad N_b := 63 \quad \text{Spacing} := \frac{Lut - 6ft}{N_b} \quad \text{Spacing} = 7.318 \text{ in}$

Therefore: Use 1-1/4"  $\phi$  x 6" Wood Screws @ 6" o.c.

**Base Plate & Anchor Bolts:**

$P_{ci} := \frac{V_6 \cdot H_t}{L_{cc}} \quad P_{ci} = 95.232 \text{ k} \quad d_1 := 12 \text{ in} \quad f_c := 3 \text{ ksi} \quad d_2 := 12 \text{ in}$

$N := 3 \quad T_w := \frac{P_{ci}}{N} \quad T = 31.744 \text{ k} \quad wf := 1.33$

Using 1 1/4"  $\phi$  A307 Anchor Bolts  $T_b := 24.5 \text{ k} \quad T_{tb} := T_b \cdot wf \quad T_{tb} = 32.585 \text{ k}$

Use 6- 1 1/4"  $\phi$  A307 Anchor Bolts

Assume: 12"x12" Base Plate:  $b := 12 \text{ in} \quad d := 12 \text{ in} \quad bf := 2 \text{ in} \quad F_{yy} := 36 \text{ ksi} \quad M_{maxF} := bf \cdot P_{ci}$

$t_w := \left( \frac{8 \cdot T_b \cdot bf}{b \cdot F_{yy}} \right)^{0.5} \quad t = 1.347 \text{ in} \quad \text{Use 1 3/8" Thick Plate}$

Use 1 3/8" x 12" x 12" Base Plate

**Footing Design For Braced Frame:**

$SBC := 2500 \text{ psf}$     $wf := 1.33$     $ts := 1 \text{ ft}$

$f_y := 60 \text{ ksi}$     $f_c := 3 \text{ ksi}$     $W_c := 150 \text{ pcf}$     $W_s := 100 \text{ pcf}$     $\frac{LL}{2} + \frac{LLa}{2}$   
 Assume 7'0"x18'6"x3'0" footing:  $b := 7 \text{ ft}$     $d := 18.5 \text{ ft}$     $tf := 3 \text{ ft}$     $M_{maxF} := Vs1 \cdot \frac{LL}{LuL} (14.33 \text{ ft} + tf)$

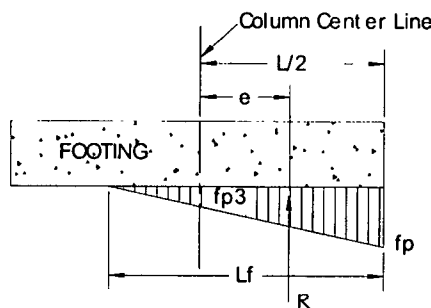
$A_f := b \cdot d$     $A_f = 129.5 \text{ ft}^2$     $M_{maxF} = 426.62 \text{ k} \cdot \text{ft}$   
 $DL_c := 7.255 \text{ k}$     $DL_c = 7.255 \text{ k}$     $DL_s := W_s \cdot A_f \cdot ts$     $DL_s = 12.95 \text{ k}$   
 $DL_f := W_c \cdot A_f \cdot tf$     $DL_f = 58.275 \text{ k}$     $DL := DL_c + DL_f + DL_s$     $DL = 78.48 \text{ k}$

$e := \frac{M_{maxF}}{DL}$     $e = 5.436 \text{ ft}$

$L_f := \left( \frac{d}{2} - e \right) \cdot 3$     $L_f = 11.442 \text{ ft}$     $f_p := \frac{DL}{0.5 \cdot b \cdot L_f}$     $f_p = 1.96 \text{ ksf}$

$F_p := SBC \cdot wf$     $F_p = 3.325 \text{ ksf}$     $f_{p3} := \frac{f_p \left( L_f - \frac{d}{2} \right)}{L_f}$     $f_{p3} = 0.375 \text{ ksf}$

$F_p > f_p$



$M_{resF} := (DL_f + DL_s) \cdot \frac{d}{2}$     $M_{resF} = 658.831 \text{ k} \cdot \text{ft}$     $M_{otF} := M_{maxF}$     $M_{otF} = 426.62 \text{ k} \cdot \text{ft}$

$FS := \frac{M_{resF}}{M_{otF}}$     $FS = 1.544$

$Result := \begin{cases} \text{"Fdn. Is Okay"} & \text{if } FS > 1.5 \\ \text{"ReDesign Fdn."} & \text{otherwise} \end{cases}$     $Result = \text{"Fdn. Is Okay"}$

**Reinforcement:**  $d := 32.5$     $cf := \text{ksi} \cdot \text{ft}$    conversion factor    $d_1 := 24 \text{ in}$

$M_u := \left[ 1.7 \cdot \left( \frac{LL_r}{DL_r + LL_r} \right) + 1.4 \cdot \left( \frac{DL_r}{DL_r + LL_r} \right) \right] \cdot M_{maxF}$     $M_u = 661.261 \text{ k} \cdot \text{ft}$

$A_s := \frac{M_u}{4 \cdot d \cdot cf \cdot 1.33}$     $A_s = 3.825 \text{ in}^2$     $A_{smin} := 0.0018 \cdot 1 \text{ ft} \cdot d_1$     $A_{smin} = 0.518 \text{ in}^2$

$A_7 := 0.60 \text{ in}^2$    Area of #7 Bar    $S_w := \frac{A_7 \cdot b}{A_s}$     $S = 13.178 \text{ in}$

$A_4 := 0.20 \text{ in}^2$    Area of #4 Bar    $S_w := \frac{A_4 \cdot b}{A_{smin}}$     $S = 32.407 \text{ in}$

**Use #7 @ 12" for Long Way & #4 @ 12" for Short Way (T&B)**

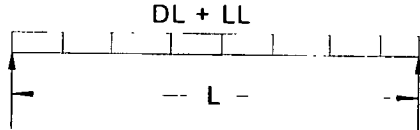
**Play Place Design:**

**Roof Wood Joist Design:**

$L_j := 19.875 \text{ ft}$

**Design of WJ for DL+LL:**

$L_j = 19.875 \text{ ft} \quad S_j = 2.667 \text{ ft} \quad DL_r = 20 \text{ psf}$



$DL_i := DL_r \cdot S_j \quad DL_i = 53.333 \text{ plf}$   
 $LL := P_g \cdot S_j \quad LL = 66.667 \text{ plf}$   
 $W_t := LL + DL_i \quad W_t = 120 \text{ plf}$

$R_{max} := \frac{W_t \cdot L_j}{2} \quad R_{max} = 1.192 \text{ k} \quad \text{@ Left Side}$

$M_{max} := \frac{R_{max}^2}{(W_t + DL_i) \cdot 2} \quad M_{max} = 4.102 \text{ k} \cdot \text{ft} \quad \text{@ Center} \quad \text{Governs}$

$M_{max} = 4.102 \text{ k} \cdot \text{ft} \quad V_{max} := R_{max} \quad V_{max} = 1.192 \text{ k}$

**Summary of Design Shear and Moments:**

$M_{max} = 4.102 \text{ k} \cdot \text{ft} \quad V_{max} = 1.192 \text{ k} \quad DL + LL$

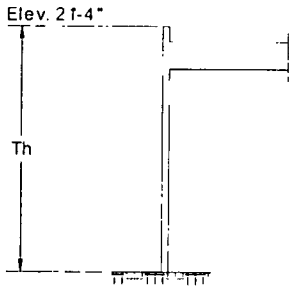
Using: TJI-L65: Depth = 11 7/8"  $L_j = 19.875 \text{ ft}$   $W_{allow} := 144 \text{ plf}$   
 Manufacturer's Design Properties :

$M_{rallow} := \left( \frac{W_{allow} \cdot L_j^2}{8} \right) \quad M_{rallow} = 7.11 \text{ k} \cdot \text{ft} \quad V_{allow} := \left( \frac{W_{allow} \cdot L_j}{2} \right) \quad V_{allow} = 1.431 \text{ k}$

**Summary:**

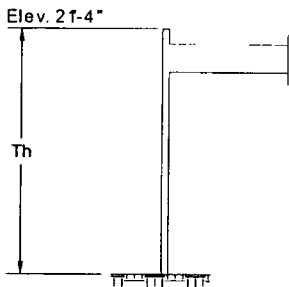
| Load Combo / Locations | Moments (k * ft) | Shear (k) | Joist Descriptions | Length (ft) | Depth (Inch) | n | Capacity (k * ft) | REMARKS           |
|------------------------|------------------|-----------|--------------------|-------------|--------------|---|-------------------|-------------------|
| DL+LL                  | 4.102            | 119       | TJI L65            | 20.25       | 14"          | 1 | 7.11              | Stiffeners        |
| Mechanical             | 4.102            | 119       | TJI L65            | 20.25       | 14"          | 1 | 7.11              | Stiffeners        |
| Menu Board             | 4.102            | 122       | TJI L65            | 20.25       | 14"          | 1 | 7.11              | Stiffeners/XBrace |

**Playplace Wind Analysis@ Side Walls:**



$$\begin{aligned} \overline{Th} &:= 21.33\text{ft} \\ Th &= 21.33 \text{ ft} & Pw &= 10.493 \text{ psf} \\ \overline{Ws} &:= Pw \cdot Th & Ws &= 223.818 \text{ plf} \\ \text{To Design the System for } \overline{Wf} &:= 460 \text{ plf} \end{aligned}$$

**Playplace Wind Analysis@ Front Walls:**

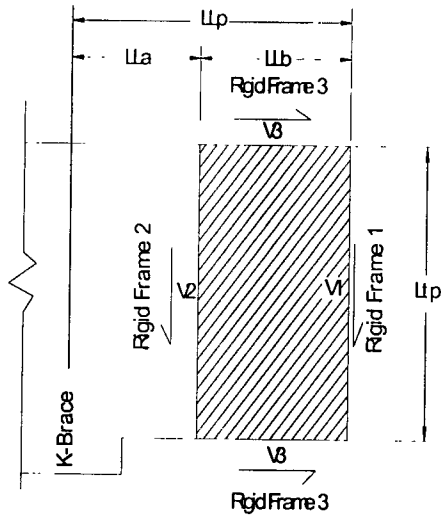


$$\begin{aligned} \overline{Th} &:= 21.33\text{ft} \\ Pw &= 10.493 \text{ psf} & Th &= 21.33 \text{ ft} \\ \overline{Wff} &:= Pw \cdot Th & Wff &= 223.818 \text{ plf} \\ \text{To Design the System for } \overline{Wf} &:= 460 \text{ plf} \end{aligned}$$

Say:  $\overline{W} := \max(Ws, Wf, Wff) \quad W = 460 \text{ plf}$

**Rigid Frame Design:**

**Playplace Frame Wind Analysis:**



Longitudinal Dimensions:

LLa = 44.52 ft  
 LLb = 21.77 ft  
 LLp := LLa + LLb  
 LLp = 66.29 ft

Transverse Dimensions:

Ltp := 37.75ft  
 V4 = 7.511 k  
 V5 = 15.19 k  
 V7 = 22.87 k

$$\underline{V1w} := W \cdot \left( \frac{LLb}{2} \right) \quad V1w = 5.007 \text{ k} \quad V1sPP := V4 \quad V1sPP = 7.511 \text{ k}$$

$$\underline{V1} := \max(V1w, V1sPP) \quad V1 = 7.511 \text{ k}$$

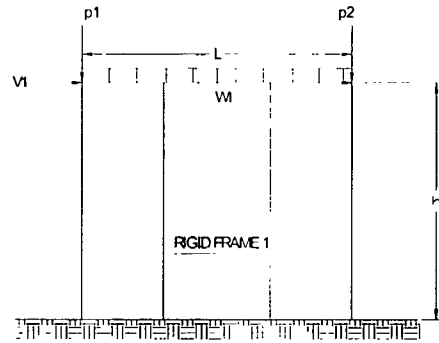
$$\underline{V2w} := W \cdot \left( \frac{LLb}{2} + \frac{LLa}{2} \right) \quad V2w = 15.247 \text{ k} \quad V2sPP := V7 \quad V2sPP = 22.87 \text{ k}$$

$$\underline{V2} := \max(V2w, V2sPP) \quad V2 = 22.87 \text{ k}$$

$$\underline{V3w} := W \cdot \left( \frac{Ltp}{2} \right) \quad V3w = 8.682 \text{ k} \quad V3sPP := V5 \quad V3sPP = 15.19 \text{ k}$$

$$\underline{V3} := \max(V3w, V3sPP) \quad V3 = 15.19 \text{ k}$$

**Rigid Frame 1:**



$$L := Ltp$$

$$L = 37.75 \text{ ft}$$

$$h := 20 \text{ ft}$$

$$V1 = 7.511 \text{ k}$$

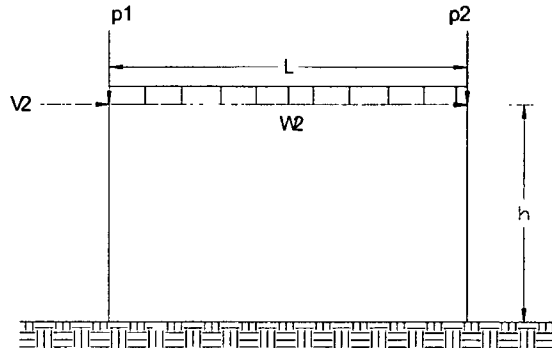
$$W1 := (Pg + LLr) \cdot \left( \frac{LLb}{2} \right) \quad W1 = 0.49 \text{ klf}$$

$$P1 := (Pg + LLr) \cdot \left( \frac{LLb}{2} \cdot \frac{Sj}{2} \right) \quad P1 = 0.653 \text{ k} \quad P2 := (Pg + LLr) \cdot \left( \frac{LLb}{2} \cdot \frac{Sj}{2} \right) \quad P2 = 0.653 \text{ k}$$

From Risa Calculations:

$$pRISA1 := 10.094 \text{ k} \quad MmaxC1 := 30.715 \text{ k} \cdot \text{ft} \quad Mmaxb1 := 42.959 \text{ k} \cdot \text{ft}$$

**Rigid Frame 2:**



$$L := 37.92 \text{ ft}$$

$$h := 13.33 \text{ ft}$$

$$V2 = 22.87 \text{ k}$$

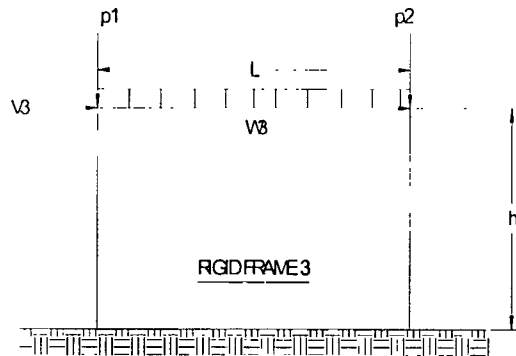
$$W2 := (Pg + LLr) \cdot \left( \frac{LLb}{2} \right) \quad W2 = 0.49 \text{ klf} \quad P1 := (Pg + LLr) \cdot \left( \frac{LLb}{2} \cdot \frac{Sj}{2} \right) \quad P1 = 0.653 \text{ k}$$

$$P2 := (Pg + LLr) \cdot \left( \frac{LLb}{2} \cdot \frac{Sj}{2} \right) \quad P2 = 0.653 \text{ k}$$

From Risa Calculations:

$$pRISA2 := 13.53 \text{ k} \quad MmaxC2 := 96.78 \text{ k} \cdot \text{ft} \quad Mmaxb2 := 94.257 \text{ k} \cdot \text{ft}$$

**Rigid Frame 3**



$$L := LLb \quad L = 21.77 \text{ ft}$$

$$h := 19.04 \text{ ft}$$

$$V3 = 15.19 \text{ k}$$

$$W3 := (Pg + LLr) \cdot \left( \frac{Sj}{2} \right) \quad W3 = 0.06 \text{ klf} \quad P1 := (Pg + LLr) \cdot \left( \frac{Ltp}{2} \cdot \frac{LLb}{2} \right) \quad P1 = 9.245 \text{ k}$$

$$P2 := (Pg + LLr) \cdot \left( \frac{Ltp}{2} \cdot \frac{LLb}{2} \right) \quad P2 = 9.245 \text{ k}$$

From Risa Calculations:

$$pRISA3 := 14.997 \text{ k} \quad MmaxC3 := 61.252 \text{ k} \cdot \text{ft} \quad Mmaxb3 := 85.073 \text{ k} \cdot \text{ft}$$

Summary of Risa Calculations:

$$pRISA := \max(pRISA1, pRISA2, pRISA3) \quad pRISA = 14.997 \text{ k}$$

$$MmaxC := \max(MmaxC1, MmaxC2, MmaxC3) \quad MmaxC = 96.78 \text{ k} \cdot \text{ft}$$

$$Mmaxb := \max(Mmaxb1, Mmaxb2, Mmaxb3) \quad Mmaxb = 94.257 \text{ k} \cdot \text{ft}$$

**Plate to Column Connections:**

$$\text{Capacity of 1/2" Plate} \quad Fu := 50 \text{ ksi} \quad t := 0.5 \text{ in} \quad Lp := 8 \text{ in} \quad fy := 36 \text{ ksi}$$

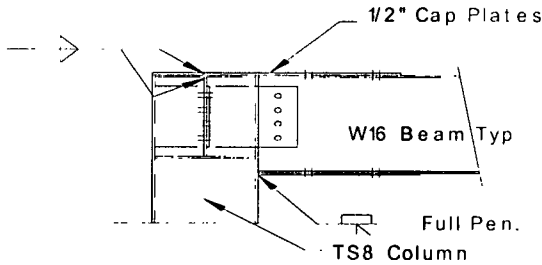
$$Ag := t \cdot Lp \quad Ag = 4 \text{ in}^2 \quad Ae := Ag - 2 \text{ in} \cdot \left( \frac{1}{16} \text{ in} + \frac{3}{4} \text{ in} \right) \quad Ae = 2.375 \text{ in}^2$$

$$Pweld := 0.6fy \cdot Ag \quad Pweld = 86.4 \text{ k} \quad Pbolt := 0.5Fu \cdot Ae \quad Pbolt = 59.375 \text{ k}$$

Use 1/2"x8"x8" Plate



**Design of Connections:**



Use: 1"  $\phi$  A325 SC Bolts:  $t_m := \frac{3}{16}$  in  $w_f := 1.33$   $d := 8$  in  
 $M_{maxC} = 96.78$  k-ft  $T = C$   $C := \frac{M_{maxC}}{d}$   $C = 145.17$  k

$V_{allow} := 13.4 \cdot w_f$   $V_{allow} = 17.822$  k  $T_{allow} := 19.4 \cdot k \cdot w_f$   $T_{allow} = 25.802$  k

No. of Bolts Required,  $N := \frac{C}{V_{allow}}$   $N = 8.146$  say  $N := 8$

Use 8 - 1"  $\phi$  A325 SC Bolts for the Connections, values are conservative

**Base Plate & Anchor Bolts:**

$d_1 := 12$  in  $f_c := 3$  ksi  $d_2 := 12$  in  $P_c := 15$  k  $M_{maxb} = 94.257$  k-ft  $pRISA = 14.997$  k

$P_{ci} := \max(P_c, pRISA)$   $P_{ci} = 15$  k

$T = C$   $C := \frac{M_{maxb}}{d_1}$   $C = 94.257$  k

Using 1 1/2"  $\phi$  A307 Anchor Bolts

$T_b := 35.3$  k  $T_{tb} := T_b \cdot w_f \cdot 2$   $T_{tb} = 93.898$  k

Use 2 - 1 1/2"  $\phi$  A307 Anchor Bolts, seismic values are conservative

Assume: 16"x16" Base Plate:  $L_p := 8$  in  $f_y := 36$  ksi

$b := 16$  in  $d := 16$  in  $b_f := 8$  in  $A_p := b \cdot d$   $A_p = 1.778$  ft<sup>2</sup>  $S := \frac{b \cdot d^2}{6}$   $S = 682.667$  in<sup>3</sup>

$f_{p1} := \frac{P_{ci}}{A_p} + \frac{M_{maxb}}{S}$   $f_{p1} = 1.715$  ksi  $f_{p2} := \frac{P_{ci}}{A_p} - \frac{M_{maxb}}{S}$   $f_{p2} = -1.598$  ksi

$F_p := 0.35f_c$   $F_p = 1.05$  ksi  $F_p > f_p$   $f_p := \max(f_{p1}, |f_{p2}|)$

$m := \frac{d - 0.95 \cdot d_2}{2}$   $m = 2.3$  in  $n := \frac{b - 0.80L_p}{2}$   $n = 4.8$  in Governs

$n_1 := \frac{\sqrt{d_2 \cdot b_f}}{4}$   $n_1 = 2.449$  in  $t := n \cdot \sqrt{\frac{f_p}{0.25 \cdot f_y \cdot 1.33}}$   $t = 1.817$  in Use 1 7/8" Thick Plate

Use 1 7/8"x 16"x16" Base Plate

**Footing Design:**  $f_y := 60 \text{ ksi}$   $f_c = 3 \text{ ksi}$   $W_c := 150 \text{ pcf}$   $W_s := 100 \text{ pcf} \cdot 2 \text{ ft}$   $w_f = 1.33$

Assume 8'6"x8'6"x2'0" footing:  $b := 8.5 \text{ ft}$   $d := 8.5 \text{ ft}$   $l_f := 2 \text{ ft}$   $M_{\text{maxT2}} := M_{\text{maxb}}$

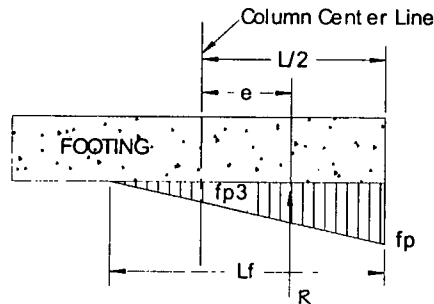
$$\begin{aligned} A_f &:= b \cdot d & A_f &= 72.25 \text{ ft}^2 \\ DL_c &:= P_c & DL_c &= 15 \text{ k} & DL_s &:= W_s \cdot A_f & DL_s &= 14.45 \text{ k} \\ DL_f &:= W_c \cdot A_f \cdot l_f & DL_f &= 21.675 \text{ k} & DL &:= DL_c + DL_f + DL_s & DL &= 51.125 \text{ k} \end{aligned}$$

$$e := \frac{M_{\text{maxT2}}}{DL} \quad e = 1.844 \text{ ft}$$

$$L_f := \left( \frac{d}{2} - e \right) \cdot 3 \quad L_f = 7.219 \text{ ft} \quad f_p := \frac{DL}{0.5 \cdot b \cdot L_f} \quad f_p = 1.666 \text{ ksf}$$

$$F_p := SBC \cdot w_f \quad F_p = 3.325 \text{ ksf} \quad f_{p3} := \frac{f_p \left( L_f - \frac{d}{2} \right)}{L_f} \quad f_{p3} = 0.685 \text{ ksf}$$

$F_p > f_p$



$$M_{\text{resF}} := (DL_f + DL_s) \cdot \frac{d}{2} \quad M_{\text{resF}} = 153.531 \text{ k} \cdot \text{ft} \quad M_{\text{otF}} := M_{\text{maxb}} \quad M_{\text{otF}} = 94.257 \text{ k} \cdot \text{ft}$$

$$FS := \frac{M_{\text{resF}}}{M_{\text{otF}}} \quad FS = 1.629$$

Result := "Fdn. Is Okay" if  $FS > 1.5$   
 "ReDesign Fdn." otherwise  
 Result = "Fdn. Is Okay"

**Reinforcement:**  $d_{11} := 20.5$   $cf := \text{ksi} \cdot \text{ft}$  conversion factor  $d_{11} := 24 \text{ in}$

$$M_u := \left[ 1.7 \cdot \left( \frac{LL_r}{DL_r + LL_r} \right) + 1.4 \cdot \left( \frac{DL_r}{DL_r + LL_r} \right) \right] \cdot M_{\text{maxb}} \quad M_u = 146.098 \text{ k} \cdot \text{ft}$$

$$A_s := \frac{M_u}{4 \cdot d \cdot cf} \quad A_s = 1.782 \text{ in}^2 \quad A_{\text{min}} := 0.0018 \cdot 1 \text{ ft} \cdot d_{11} \quad A_{\text{min}} = 0.518 \text{ in}^2$$

$$A_5 := 0.31 \text{ in}^2 \quad \text{Area of \# 5 Bar} \quad S := \frac{A_5 \cdot b}{A_s} \quad S = 17.747 \text{ in}$$

**Use #5 @ 12" Each Way, Top and Bottom**

**Base Plate & Anchor Bolts (PP - TS4):**

$$d1 := 12\text{in} \quad f_c := 3\text{ksi} \quad d2 := 12\text{in} \quad P_c := 15\text{k} \quad M_{\text{maxb1TS4}} := 5.612\text{k}\cdot\text{ft} \quad p\text{RISA1} = 10.094\text{k}$$

$$P_{ci} := \max(P_c, p\text{RISA1}) \quad P_{ci} = 15\text{k}$$

$$T = C \quad C := \frac{M_{\text{maxb1TS4}}}{d2} \quad C = 5.612\text{k} \quad w_f := 1.33$$

Using 3/4"  $\phi$  A307 Anchor Bolts

$$T_b := 8.8\text{k} \quad T_{tb} := 2 \cdot T_b \cdot w_f \quad T_{tb} = 23.408\text{k}$$

Use 2- 3/4"  $\phi$  A307 Anchor Bolts

Assume: 12"x12" Base Plate:  $L_p := 4\text{in} \quad f_y := 36\text{ksi}$

$$b := 12\text{in} \quad d := 12\text{in} \quad b_f := 4\text{in}$$

$$A_p := b \cdot d \quad A_p = 1\text{ft}^2 \quad S := \frac{b \cdot d^2}{6} \quad S = 288\text{in}^3$$

$$f_{p1} := \frac{P_{ci}}{A_p} + \frac{M_{\text{maxb1TS4}}}{S} \quad f_{p1} = 0.338\text{ksi} \quad f_{p2} := \frac{P_{ci}}{A_p} - \frac{M_{\text{maxb1TS4}}}{S} \quad f_{p2} = -0.13\text{ksi}$$

$$F_p := 0.35f_c \quad F_p = 1.05\text{ksi} \quad F_p > f_p \quad f_p := \max(f_{p1}, |f_{p2}|)$$

$$m := \frac{d - 0.95 \cdot d2}{2} \quad m = 0.3\text{in} \quad n := \frac{b - 0.80L_p}{2} \quad n = 4.4\text{in} \quad \text{Governs}$$

$$n1 := \frac{\sqrt{d2 \cdot b_f}}{4} \quad n1 = 1.732\text{in} \quad t := n \cdot \sqrt{\frac{f_p}{0.25 \cdot f_y \cdot 1.33}} \quad t = 0.739\text{in} \quad \text{Use 3/4" Thick Plate}$$

Use 3/4"x 12"x12" Base Plate

**Footing Design (PP-1TS4)**

SBC := 2500psf

$f_y := 60\text{ksi}$     $f_c = 3\text{ksi}$     $W_c := 150\text{pcf}$     $W_s := 100\text{psf}$     $w_f = 1.33$

Assume 3'6"x3'6"x2'0" footing:  $b := 3.5\text{ft}$     $d := 3.5\text{ft}$     $t_f := 2\text{ft}$     $M_{\text{maxb1TS4}} = 5.612\text{ k}\cdot\text{ft}$

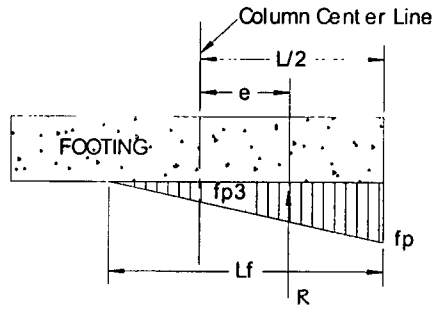
$A_f := b \cdot d$     $A_f = 12.25\text{ ft}^2$   
 $DL_c := P_{ci}$     $DL_c = 15\text{ k}$     $DL_s := W_s \cdot A_f$     $DL_s = 1.225\text{ k}$   
 $DL_f := W_c \cdot A_f \cdot t_f$     $DL_f = 3.675\text{ k}$     $DL := DL_c + DL_f + DL_s$     $DL = 19.9\text{ k}$   
 $e := \frac{M_{\text{maxb1TS4}}}{DL}$     $e = 0.282\text{ ft}$     $L_f := \left(\frac{d}{2} - e\right) \cdot 3$     $L_f = 4.404\text{ ft}$

$f_p := \frac{DL}{0.5 \cdot b \cdot L_f}$     $f_p = 2.582\text{ ksf}$

$F_p := SBC \cdot w_f$     $F_p = 3.325\text{ ksf}$

$f_{p3} := \frac{f_p \left(L_f - \frac{d}{2}\right)}{L_f}$     $f_{p3} = 1.556\text{ ksf}$

$F_p > f_p$



$M_{\text{resF}} := (DL_f + DL_s) \cdot \frac{d}{2}$     $M_{\text{resF}} = 8.575\text{ k}\cdot\text{ft}$     $M_{\text{otF}} := M_{\text{maxb1TS}} \cdot M_{\text{otF}} = 5.612\text{ k}\cdot\text{ft}$

$FS := \frac{M_{\text{resF}}}{M_{\text{otF}}}$     $FS = 1.528$

Result := "Fdn. Is Okay" if  $FS > 1.5$   
 "ReDesign Fdn." otherwise   **Result = "Fdn. Is Okay"**

Reinforcement:  $d := 20.5$     $cf := \text{ksi}\cdot\text{ft}$  conversion factor

$M_u := \left[ 1.7 \cdot \left(\frac{LL_r}{DL_r + LL_r}\right) + 1.4 \cdot \left(\frac{DL_r}{DL_r + LL_r}\right) \right] \cdot M_{\text{max}}$     $M_u = 8.699\text{ k}\cdot\text{ft}$

$A_s := \frac{M_u}{d \cdot cf}$     $A_s = 0.106\text{ in}^2$     $A_{s\text{min}} := 0.0018 \cdot 1\text{ft} \cdot t_f$     $A_{s\text{min}} = 0.518\text{ in}^2$

$A_4 := 0.20\text{ in}^2$    Area of # 4 Bar    $S := \frac{A_4 \cdot b}{A_{s\text{min}}}$     $S = 16.204\text{ in}$

**Use #4 @ 12" Each Way,  
 T&B**

**Footing Check (Shear Walls "A" & "C"):**

$f_y := 60 \text{ ksi}$     $f_c := 1500 \text{ psi}$     $W_c := 0.15 \text{ kcf}$     $W_s := 0.10 \text{ kcf}$     $Mot := V3 \cdot hs$

$Mot = 202.486 \text{ ftk}$    Try 1.0 ft Deep x 2 ft Wide x 26.67 ft Long Footing    $t_f := 1 \text{ ft}$

$d_s := 12 \text{ in}$     $w := 2 \cdot \text{ft}$     $l := LsA + 3 \text{ ft}$     $l = 29.67 \text{ ft}$     $P_{wall} := DL_{wall} \cdot hs \cdot LsA$

$P_{ftg} := t_f \cdot w \cdot l \cdot W_c$     $P_{ftg} = 8.901 \text{ k}$     $P_{stem} := 8 \text{ in} \cdot (d_s) \cdot l \cdot W_c$     $P_{stem} = 2.967 \text{ k}$

$P_{soil} := (d_s - 6 \text{ in}) \cdot l \cdot W_s \cdot (w - 8 \text{ in})$     $P_{soil} = 1.978 \text{ k}$     $P_t := P_{ftg} + P_{soil} + P_{stem} + P_{wall}$

$P_t = 20.956 \text{ k}$

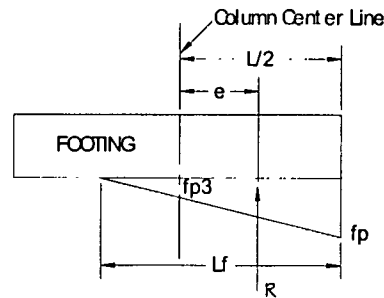
$M_{res} := P_t \cdot \frac{l}{2} + \frac{Pdl \cdot LsA}{2}$     $M_{res} = 382.574 \text{ ftk}$

$SF := \frac{M_{res}}{Mot}$     $SF = 1.889$    Safety Factor,  $SF > 1.5$  OK

$e := \frac{Mot}{P_t + Pdl}$     $e = 7.69 \text{ ft}$

$L_f := \left( \frac{l}{2} - e \right) \cdot 3$     $L_f = 21.436 \text{ ft}$

$f_p := \frac{(P_t + Pdl) \cdot 2}{L_f \cdot w}$     $\frac{f_p}{1.33} = 0.924 \text{ ksf}$     $f_p < 2.5$  OK



**Footing Check (Shear Walls "B"):**    $W_c := 0.15 \text{ kcf}$     $W_s := 0.10 \text{ kcf}$     $Mot := V1 \cdot hs$

$Mot = 100.116 \text{ ftk}$    Try 1.0 ft Deep x 2 ft Wide x 26.02 ft Long Footing    $t_f := 1 \text{ ft}$

$d_s := 12 \text{ in}$     $w := 2 \cdot \text{ft}$     $l := LsB + 3 \text{ ft}$     $l = 29.02 \text{ ft}$     $P_{wall} := DL_{wall} \cdot hs \cdot LsB$

$P_{ftg} := t_f \cdot w \cdot l \cdot W_c$     $P_{ftg} = 8.706 \text{ k}$     $P_{stem} := 8 \text{ in} \cdot (d_s) \cdot l \cdot W_c$     $P_{stem} = 2.902 \text{ k}$

$P_{soil} := (d_s - 6 \text{ in}) \cdot l \cdot W_s \cdot (w - 8 \text{ in})$     $P_{soil} = 1.935 \text{ k}$     $P_t := P_{ftg} + P_{soil} + P_{stem} + P_{wall}$

$P_t = 20.48 \text{ k}$

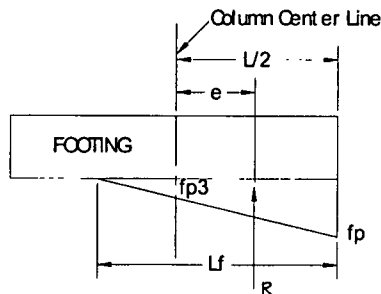
$M_{res} := P_t \cdot \frac{l}{2} + \frac{Pdl \cdot LsA}{2}$     $M_{res} = 368.848 \text{ ftk}$

$SF := \frac{M_{res}}{Mot}$     $SF = 3.684$    Safety Factor,  $SF > 1.5$  OK

$e := \frac{Mot}{P_t + Pdl}$     $e = 3.872 \text{ ft}$

$L_f := \left( \frac{l}{2} - e \right) \cdot 3$     $L_f = 31.914 \text{ ft}$

$f_p := \frac{(P_t + Pdl) \cdot 2}{L_f \cdot w}$     $\frac{f_p}{1.33} = 0.609 \text{ ksf}$     $f_p < 2.5$  OK



**Global**

|  |       |
|--|-------|
| Display Sections for Member Calcs      | 5     |
| Max Internal Sections for Member Calcs | 97    |
| Include Shear Deformation              | Yes   |
| Merge Tolerance (in)                   | .12   |
| P-Delta Analysis Tolerance             | 0.50% |

|                        |               |
|------------------------|---------------|
| Hot Rolled Steel Code  | AISC: ASD 9th |
| Cold Formed Steel Code | AISI 99: ASD  |
| NDS Wood Code          | NDS 91: ASD   |
| NDS Temperature        | < 100F        |
| Concrete Code          | ACI 1999      |

|                               |             |
|-------------------------------|-------------|
| Number of Shear Regions       | 4           |
| Region Spacing Increment (in) | 4           |
| Concrete Stress Block         | Rectangular |
| Use Cracked Sections          | Yes         |
| Bad Framing Warnings          | No          |
| Unused Force Warnings         | Yes         |

**Member Primary Data**

|   | Label | I Joint | J Joint | Rotate(deg) | Section/Shape | Design List | Type | Material | Design Rules |
|---|-------|---------|---------|-------------|---------------|-------------|------|----------|--------------|
| 1 | M1    | N1      | N2      |             | SEC3          | Tube        | Beam | HR2      | Typical      |
| 2 | M2    | N3      | N4      |             | SEC3          | Tube        | Beam | HR2      | Typical      |
| 3 | M3    | N2      | N6      |             | SEC2          | Tube        | Beam | HR STL   | Typical      |
| 4 | M4    | N6      | N5      |             | SEC1          | Tube        | Beam | HR2      | Typical      |
| 5 | M6    | N8      | N7      |             | SEC1          | Tube        | Beam | HR2      | Typical      |
| 6 | M3a   | N6      | N8      |             | SEC2          | Tube        | Beam | HR STL   | Typical      |
| 7 | M3b   | N8      | N4      |             | SEC2          | Tube        | Beam | HR STL   | Typical      |

**Hot Rolled Steel Design Parameters**

|   | Label | Shape | Length(ft) | Lb-out(ft) | Lb-in(ft) | Lcomp top(ft) | Lcomp bot(ft) | K-out | K-in | Cm | Cb | Out s... | In sway |
|---|-------|-------|------------|------------|-----------|---------------|---------------|-------|------|----|----|----------|---------|
| 1 | M1    | SEC3  | 20         |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 2 | M2    | SEC3  | 20         |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 3 | M3    | SEC2  | 11.15      |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 4 | M4    | SEC1  | 20         |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 5 | M6    | SEC1  | 20         |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 6 | M3a   | SEC2  | 12         |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 7 | M3b   | SEC2  | 13.77      |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |

**Joint Coordinates and Temperatures**

|   | Label | X (ft) | Y (ft) | Temp (F) |
|---|-------|--------|--------|----------|
| 1 | N1    | 0      | 0      | 0        |
| 2 | N2    | 0      | 20     | 0        |
| 3 | N3    | 36.92  | 0      | 0        |
| 4 | N4    | 36.92  | 20     | 0        |
| 5 | N5    | 11.15  | 0      | 0        |
| 6 | N6    | 11.15  | 20     | 0        |
| 7 | N7    | 23.15  | 0      | 0        |
| 8 | N8    | 23.15  | 20     | 0        |

Company : McDonald's Corporation  
 Designer : pmp  
 Job Number : 046-0005

Tukwila, WA

Oct 12, 2007  
 10:40 AM  
 Checked By: \_\_\_\_\_

**Hot Rolled Steel Properties**

|   | Label  | E [ksi] | G [ksi] | Nu | Therm (1/E5 F) | Density[k/ft^3] | Yield[ksi] |
|---|--------|---------|---------|----|----------------|-----------------|------------|
| 1 | HR STL | 29000   | 11154   | 3  | .65            | .49             | 36         |
| 2 | HR2    | 29000   | 11154   | 3  | .65            | .49             | 46         |

**Hot Rolled Steel Section Sets**

|   | Label | Shape    | Design List | Type | Material | Design Rules | A [in2] | I (90,270) [in4] | I (0,180) [in4] |
|---|-------|----------|-------------|------|----------|--------------|---------|------------------|-----------------|
| 1 | SEC1  | HSS4X4X5 | Tube        | Beam | HR2      | Typical      | 4.095   | 9.128            | 9.128           |
| 2 | SEC2  | W8X24    | Tube        | Beam | HR STL   | Typical      | 7.08    | 18.3             | 82.8            |
| 3 | SEC3  | HSS8X8X8 | Tube        | Beam | HR2      | Typical      | 13.458  | 124.613          | 124.613         |

**Basic Load Cases**

|   | BLC Description | Category | X Gravity | Y Gravity | Joint | Point | Distributed |
|---|-----------------|----------|-----------|-----------|-------|-------|-------------|
| 1 | Wind Load       | WL       |           |           | 1     |       | 1           |
| 2 | Dead + Live     | OL1      |           |           | 2     |       | 3           |

**Load Combinations**

|   | Description | Solve PD... | SR... | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor |
|---|-------------|-------------|-------|------------|------------|------------|------------|------------|------------|------------|------------|
| 1 | Total Load  |             |       | 1          | 1          | 2          | 1          |            |            |            |            |

**Joint Loads and Enforced Displacements (BLC 1 : Wind Load)**

|   | Joint Label | L.D.M | Direction | Magnitude[k.k-ft in.rad k*s^2/ft] |
|---|-------------|-------|-----------|-----------------------------------|
| 1 | N4          | L     | X         | -7.511                            |

**Joint Loads and Enforced Displacements (BLC 2 : Dead + Live)**

|   | Joint Label | L.D.M | Direction | Magnitude[k.k-ft in.rad k*s^2/ft] |
|---|-------------|-------|-----------|-----------------------------------|
| 1 | N2          | L     | Y         | -653                              |
| 2 | N4          | L     | Y         | 653                               |

**Member Distributed Loads (BLC 1 : Wind Load)**

|   | Member Label | Direction | Start Magnitude[k/ft.d...] | End Magnitude[k/ft.d...] | Start Location[ft.%] | End Location[ft.%] |
|---|--------------|-----------|----------------------------|--------------------------|----------------------|--------------------|
| 1 | M1           | Y         | 0                          | 0                        | 0                    | 0                  |

**Member Distributed Loads (BLC 2 : Dead + Live)**

|   | Member Label | Direction | Start Magnitude[k/ft.d...] | End Magnitude[k/ft.d...] | Start Location[ft.%] | End Location[ft.%] |
|---|--------------|-----------|----------------------------|--------------------------|----------------------|--------------------|
| 1 | M3           | Y         | -49                        | -49                      | 0                    | 0                  |
| 2 | M3a          | Y         | -49                        | -49                      | 0                    | 0                  |
| 3 | M3b          | Y         | -49                        | -49                      | 0                    | 0                  |

**Member ASD Steel Code Checks (By Combination)**

|   | LC | Member | Shape    | UC Max | Loc[ft] | Shear UC | Loc[ft] | Fa[ksi] | Fi[ksi] | Fb[ksi] | Cb    | Cm  | Eqn  |
|---|----|--------|----------|--------|---------|----------|---------|---------|---------|---------|-------|-----|------|
| 1 | 1  | M1     | HSS8X8X8 | .422   | 0       | .020     | 0       | 20.565  | 36.791  | 40.47   | 2.3   | .85 | H1-2 |
| 2 | 1  | M2     | HSS8X8X8 | .367   | 0       | .016     | 0       | 20.565  | 36.791  | 40.47   | 2.3   | .85 | H1-2 |
| 3 | 1  | M3     | W8X24    | .631   | 0       | .157     | 0       | 17.322  | 28.793  | 28.793  | 1.889 | .85 | H1-2 |
| 4 | 1  | M4     | HSS4X4X5 | .353   | 0       | .007     | 0       | 5.35    | 36.791  | 36.791  | 2.3   | .85 | H1-1 |
| 5 | 1  | M6     | HSS4X4X5 | .966   | 0       | .008     | 0       | 5.35    | 36.791  | 36.791  | 2.3   | .85 | H1-1 |
| 6 | 1  | M3a    | W8X24    | .271   | 12      | .106     | 12      | 16.007  | 28.793  | 28.793  | 1.717 | .85 | H1-2 |
| 7 | 1  | M3b    | W8X24    | .449   | 12.479  | .165     | 0       | 13.063  | 28.793  | 28.793  | 1     | .85 | H1-2 |

**Member Section Forces (By Combination)**

| LC | Member Label | Sec | Axial[k] | Shear[k] | Moment[k-ft] |         |
|----|--------------|-----|----------|----------|--------------|---------|
| 1  | 1            | M1  | 1        | 6.491    | -3.684       | -42.959 |
| 2  |              |     | 2        | 6.491    | -3.684       | -24.54  |
| 3  |              |     | 3        | 6.491    | -3.684       | -6.122  |
| 4  |              |     | 4        | 6.491    | -3.684       | 12.297  |
| 5  |              |     | 5        | 6.491    | -3.684       | 30.715  |
| 6  | 1            | M2  | 1        | 1.262    | -2.963       | -38.276 |
| 7  |              |     | 2        | 1.262    | -2.963       | -23.459 |
| 8  |              |     | 3        | 1.262    | -2.963       | -8.642  |
| 9  |              |     | 4        | 1.262    | -2.963       | 6.175   |
| 10 |              |     | 5        | 1.262    | -2.963       | 20.992  |
| 11 | 1            | M3  | 1        | 3.684    | 5.838        | 30.715  |
| 12 |              |     | 2        | 3.684    | 4.473        | 16.344  |
| 13 |              |     | 3        | 3.684    | 3.107        | 5.781   |
| 14 |              |     | 4        | 3.684    | 1.741        | -9.976  |
| 15 |              |     | 5        | 3.684    | .375         | -3.925  |
| 16 | 1            | M4  | 1        | 1.549    | -.426        | -4.319  |
| 17 |              |     | 2        | 1.549    | -.426        | -2.191  |
| 18 |              |     | 3        | 1.549    | -.426        | -.063   |
| 19 |              |     | 4        | 1.549    | -.426        | 2.065   |
| 20 |              |     | 5        | 1.549    | -.426        | 4.193   |
| 21 | 1            | M6  | 1        | 10.094   | -.438        | -4.487  |
| 22 |              |     | 2        | 10.094   | -.438        | -2.295  |
| 23 |              |     | 3        | 10.094   | -.438        | -1.103  |
| 24 |              |     | 4        | 10.094   | -.438        | 2.088   |
| 25 |              |     | 5        | 10.094   | -.438        | 4.28    |
| 26 | 1            | M3a | 1        | 4.109    | 1.924        | 3.394   |
| 27 |              |     | 2        | 4.109    | .454         | -3.172  |
| 28 |              |     | 3        | 4.109    | 1.016        | 2.328   |
| 29 |              |     | 4        | 4.109    | -2.486       | 2.925   |
| 30 |              |     | 5        | 4.109    | -3.956       | 12.589  |
| 31 | 1            | M3b | 1        | 4.548    | 6.138        | 17.076  |
| 32 |              |     | 2        | 4.548    | 4.451        | 1.152   |
| 33 |              |     | 3        | 4.548    | 2.765        | -13.572 |
| 34 |              |     | 4        | 4.548    | 1.078        | -20.186 |
| 35 |              |     | 5        | 4.548    | -.609        | -20.992 |



**Global**

|  |       |
|--|-------|
| Display Sections for Member Calcs      | 5     |
| Max Internal Sections for Member Calcs | 97    |
| Include Shear Deformation              | Yes   |
| Merge Tolerance (in)                   | .12   |
| P-Delta Analysis Tolerance             | 0.50% |

|                        |               |
|------------------------|---------------|
| Hot Rolled Steel Code  | AISC: ASD 9th |
| Cold Formed Steel Code | AISI 99: ASD  |
| NDS Wood Code          | NDS 91: ASD   |
| NDS Temperature        | < 100F        |
| Concrete Code          | ACI 1999      |

|                               |             |
|-------------------------------|-------------|
| Number of Shear Regions       | 4           |
| Region Spacing Increment (in) | 4           |
| Concrete Stress Block         | Rectangular |
| Use Cracked Sections          | Yes         |
| Bad Framing Warnings          | No          |
| Unused Force Warnings         | Yes         |

**Member Primary Data**

| Label | I Joint | J Joint | Rotate(deg) | Section/Shape | Design List | Type        | Material | Design Rules |         |
|-------|---------|---------|-------------|---------------|-------------|-------------|----------|--------------|---------|
| 1     | M1      | N1      | N2          |               | SEC1        | Tube        | Beam     | HR2          | Typical |
| 2     | M2      | N3      | N4          |               | SEC1        | Tube        | Beam     | HR2          | Typical |
| 3     | M3      | N2      | N4          |               | SEC2        | Wide Flange | Beam     | HR_STL       | Typical |

**Hot Rolled Steel Design Parameters**

| Label | Shape | Length[ft] | Lb-out[ft] | Lb-in[ft] | Lcomp top[ft] | Lcomp bot[ft] | K-out | K-in | Cm | Cb | Out s... | In sway |
|-------|-------|------------|------------|-----------|---------------|---------------|-------|------|----|----|----------|---------|
| 1     | M1    | SEC1       | 13.33      |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 2     | M2    | SEC1       | 13.33      |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 3     | M3    | SEC2       | 36.92      |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |

**Joint Coordinates and Temperatures**

| Label | X [ft] | Y [ft] | Temp [F] |
|-------|--------|--------|----------|
| 1     | N1     | 0      | 0        |
| 2     | N2     | 0      | 13.33    |
| 3     | N3     | 36.92  | 0        |
| 4     | N4     | 36.92  | 13.33    |

**Hot Rolled Steel Properties**

| Label | E [ksi] | G [ksi] | Nu    | Therm (1E5 F) | Density[k/ft^3] | Yield[ksi] |    |
|-------|---------|---------|-------|---------------|-----------------|------------|----|
| 1     | HR_STL  | 29000   | 11154 | .3            | .65             | .49        | 36 |
| 2     | HR2     | 29000   | 11154 | .3            | .65             | .49        | 46 |

**Hot Rolled Steel Section Sets**

| Label | Shape | Design List | Type        | Material | Design Rules | A [in^2] | I (90.270) [in^4] | I (0.180) [in^4] |         |
|-------|-------|-------------|-------------|----------|--------------|----------|-------------------|------------------|---------|
| 1     | SEC1  | HSS8X8X8    | Tube        | Beam     | HR2          | Typical  | 13.458            | 124.613          | 124.613 |
| 2     | SEC2  | W16X57      | Wide Flange | Beam     | HR_STL       | Typical  | 16.8              | 43.1             | 758     |

Company : McDonald's Corporation  
 Designer : pmp  
 Job Number : 046-0005

Tukwila, WA

Oct 12, 2007  
 10:40 AM  
 Checked By: \_\_\_\_\_

**Basic Load Cases**

| BLC Description | Category | X Gravity | Y Gravity | Joint | Point | Distributed |
|-----------------|----------|-----------|-----------|-------|-------|-------------|
| 1 Wind Load     | WL       |           |           | 1     |       |             |
| 2 Dead + Live   | OL1      |           |           | 2     | 1     | 1           |

**Load Combinations**

| Description  | Solve PD... | SR... | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor |
|--------------|-------------|-------|------------|------------|------------|------------|------------|------------|------------|
| 1 Total Load |             |       | 1          | 1          | 2          | 1          |            |            |            |

**Joint Loads and Enforced Displacements (BLC 1 : Wind Load)**

| Joint Label | L.D.M | Direction | Magnitude[k,k-ft in,rad k*s^2/ft] |
|-------------|-------|-----------|-----------------------------------|
| 1 N2        | L     | X         | 22.87                             |

**Joint Loads and Enforced Displacements (BLC 2 : Dead + Live)**

| Joint Label | L.D.M | Direction | Magnitude[k,k-ft in,rad k*s^2/ft] |
|-------------|-------|-----------|-----------------------------------|
| 1 N2        | L     | Y         | -653                              |
| 2 N4        | L     | Y         | -653                              |

**Member Distributed Loads (BLC 1 : Wind Load)**

| Member Label | Direction | Start Magnitude[k/ft,d...] | End Magnitude[k/ft,d...] | Start Location[ft.%] | End Location[ft.%] |
|--------------|-----------|----------------------------|--------------------------|----------------------|--------------------|
| 1 M1         | Y         | 0                          | 0                        | 0                    | 0                  |

**Member Distributed Loads (BLC 2 : Dead + Live)**

| Member Label | Direction | Start Magnitude[k/ft,d...] | End Magnitude[k/ft,d...] | Start Location[ft.%] | End Location[ft.%] |
|--------------|-----------|----------------------------|--------------------------|----------------------|--------------------|
| 1 M3         | Y         | -49                        | -49                      | 0                    | 0                  |

**Member ASD Steel Code Checks (By Combination)**

| LC | Member | Shape | UC Max   | Loc[ft] | Shear UC | Loc[ft] | Fa[ksj] | Ft[ksj] | Fb[ksj] | Cb    | Cm  | Eqn  |
|----|--------|-------|----------|---------|----------|---------|---------|---------|---------|-------|-----|------|
| 1  | 1      | M1    | HSS8X8X8 | 670     | 0        | 0       | 27.754  | 36.791  | 40.47   | 2.3   | .85 | H1-2 |
| 2  | 1      | M2    | HSS8X8X8 | 948     | 13.33    | 0       | 27.754  | 36.791  | 40.47   | 2.3   | .85 | H1-2 |
| 3  | 1      | M3    | W16X57   | 900     | 36.92    | 0.95    | 1.807   | 28.793  | 25.717  | 2.299 | .85 | H1-1 |

**Member Section Forces (By Combination)**

| LC | Member Label | Sec | Axial[k] | Shear[k] | Moment[k-ft] |
|----|--------------|-----|----------|----------|--------------|
| 1  | 1            | M1  |          |          |              |
| 2  | 1            | M1  | 5.867    | 8.539    | 69.132       |
| 3  | 1            | M1  | 5.867    | 8.539    | 40.677       |
| 4  | 1            | M1  | 5.867    | 8.539    | 12.222       |
| 5  | 1            | M1  | 5.867    | 8.539    | 16.233       |
| 6  | 1            | M2  | 13.53    | 14.331   | -44.688      |
| 7  | 1            | M2  | 13.53    | 14.331   | 94.257       |
| 8  | 1            | M2  | 13.53    | 14.331   | 46.498       |
| 9  | 1            | M2  | 13.53    | 14.331   | -1.262       |
| 10 | 1            | M2  | 14.331   | 14.331   | -49.021      |
| 11 | 1            | M2  | 14.331   | 5.214    | 96.78        |
| 12 | 1            | M2  | 14.331   | 69.132   | -44.688      |
| 13 | 1            | M2  | 14.331   | -3.832   | 71.938       |
| 14 | 1            | M2  | 14.331   | -8.354   | -57.443      |
| 15 | 1            | M2  | 14.331   | -12.877  | 96.78        |

**Global**

|  |       |
|--|-------|
| Display Sections for Member Calcs      | 5     |
| Max Internal Sections for Member Calcs | 97    |
| Include Shear Deformation              | Yes   |
| Merge Tolerance (in)                   | .12   |
| P-Delta Analysis Tolerance             | 0.50% |

|                        |               |
|------------------------|---------------|
| Hot Rolled Steel Code  | AISC: ASD 9th |
| Cold-Formed Steel Code | AISI: 99: ASD |
| NDS Wood Code          | NDS 91: ASD   |
| NDS Temperature        | < 100F        |
| Concrete Code          | ACI 1999      |

|                               |             |
|-------------------------------|-------------|
| Number of Shear Regions       | 4           |
| Region Spacing Increment (in) | 4           |
| Concrete Stress Block         | Rectangular |
| Use Cracked Sections          | Yes         |
| Bad Framing Warnings          | No          |
| Unused Force Warnings         | Yes         |

**Member Primary Data**

|   | Label | I Joint | J Joint | Rotate(deg) | Section/Shape | Design List | Type | Material | Design Rules |
|---|-------|---------|---------|-------------|---------------|-------------|------|----------|--------------|
| 1 | M1    | N1      | N2      |             | SEC1          | Tube        | Beam | HR2      | Typical      |
| 2 | M2    | N3      | N4      |             | SEC1          | Tube        | Beam | HR2      | Typical      |
| 3 | M3    | N2      | N4      |             | SEC2          | Wide Flange | Beam | HR_STL   | Typical      |

**Hot Rolled Steel Design Parameters**

|   | Label | Shape | Length[ft] | Lb-out[ft] | Lb-in[ft] | Lcomp top[ft] | Lcomp bot[ft] | K-out | K-in | Cm | Cb | Out s... | In sway |
|---|-------|-------|------------|------------|-----------|---------------|---------------|-------|------|----|----|----------|---------|
| 1 | M1    | SEC1  | 19.04      |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 2 | M2    | SEC1  | 19.04      |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |
| 3 | M3    | SEC2  | 19.875     |            |           |               |               | 1.2   | 1.2  |    |    |          | Yes     |

**Joint Coordinates and Temperatures**

|   | Label | X [ft] | Y [ft] | Temp [F] |
|---|-------|--------|--------|----------|
| 1 | N1    | 0      | 0      | 0        |
| 2 | N2    | 0      | 19.04  | 0        |
| 3 | N3    | 19.875 | 0      | 0        |
| 4 | N4    | 19.875 | 19.04  | 0        |

**Hot Rolled Steel Properties**

|   | Label  | E [ksi] | G [ksi] | Nu | Therm (1E5 F) | Density[k/ft^3] | Yield[ksi] |
|---|--------|---------|---------|----|---------------|-----------------|------------|
| 1 | HR STL | 29000   | 11154   | .3 | .65           | .49             | 36         |
| 2 | HR2    | 29000   | 11154   | .3 | .65           | .49             | 46         |

**Hot Rolled Steel Section Sets**

|   | Label | Shape    | Design List | Type | Material | Design Rules | A [in2] | I (90,270) [in4] | I (0,180) [in4] |
|---|-------|----------|-------------|------|----------|--------------|---------|------------------|-----------------|
| 1 | SEC1  | HSS8X8X8 | Tube        | Beam | HR2      | Typical      | 13.458  | 124.613          | 124.613         |
| 2 | SEC2  | W8X31    | Wide Flange | Beam | HR_STL   | Typical      | 9.13    | 37.1             | 110             |

**Basic Load Cases**

| BLC Description | Category | X Gravity | Y Gravity | Joint | Point | Distributed |
|-----------------|----------|-----------|-----------|-------|-------|-------------|
| 1 Wind Load     | WL       |           |           | 1     |       | 1           |
| 2 Dead + Live   | OL1      |           |           | 2     |       | 1           |

**Load Combinations**

| Description  | Solve PD... | SR... | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor | BLC Factor |
|--------------|-------------|-------|------------|------------|------------|------------|------------|------------|------------|------------|
| 1 Total Load |             |       | 1          | 1          | 2          | 1          |            |            |            |            |

**Joint Loads and Enforced Displacements (BLC 1 : Wind Load)**

| Joint Label | L.D.M | Direction | Magnitude[k.k-ft in.rad k*s^2/ft] |
|-------------|-------|-----------|-----------------------------------|
| 1 N2        | L     | X         | 15.19                             |

**Joint Loads and Enforced Displacements (BLC 2 : Dead + Live)**

| Joint Label | L.D.M | Direction | Magnitude[k.k-ft in.rad k*s^2/ft] |
|-------------|-------|-----------|-----------------------------------|
| 1 N2        | L     | Y         | -8.426                            |
| 2 N4        | L     | Y         | -8.426                            |

**Member Distributed Loads (BLC 1 : Wind Load)**

| Member Label | Direction | Start Magnitude[k/ft.d.. | End Magnitude[k/ft.d... | Start Location[ft.%] | End Location[ft.%] |
|--------------|-----------|--------------------------|-------------------------|----------------------|--------------------|
| 1 M1         | Y         | 0                        | 0                       | 0                    | 0                  |

**Member Distributed Loads (BLC 2 : Dead + Live)**

| Member Label | Direction | Start Magnitude[k/ft.d.. | End Magnitude[k/ft.d... | Start Location[ft.%] | End Location[ft.%] |
|--------------|-----------|--------------------------|-------------------------|----------------------|--------------------|
| 1 M3         | Y         | -0.053                   | -0.053                  | 0                    | 0                  |

**Member ASD Steel Code Checks (By Combination)**

| LC | Member | Shape | UC Max | Loc[ft] | Shear UC | Loc[ft] | Fa[ksil] | Fi[ksil] | Fb[ksil] | Cb  | Cm  | Eqn  |
|----|--------|-------|--------|---------|----------|---------|----------|----------|----------|-----|-----|------|
| 1  | 1      | M1    | .806   | 0       | .041     | 0       | 21.703   | 36.791   | 40.47    | 2.3 | .85 | H1-2 |
| 2  | 1      | M2    | .840   | 0       | .042     | 0       | 21.703   | 36.791   | 40.47    | 2.3 | .85 | H1-2 |
| 3  | 1      | M3    | .958   | 19.875  | .150     | 19.875  | 9.875    | 28.793   | 28.793   | 2.3 | .85 | H1-2 |

**Member Section Forces (By Combination)**

| LC | Member Label | Sec | Axial[k] | Shear[k] | Moment[k-ft] |         |
|----|--------------|-----|----------|----------|--------------|---------|
| 1  | 1            | M1  | 1        | 2.908    | 7.505        | 84.016  |
| 2  |              |     | 2        | 2.908    | 7.505        | 48.293  |
| 3  |              |     | 3        | 2.908    | 7.505        | 12.569  |
| 4  |              |     | 4        | 2.908    | 7.505        | 23.154  |
| 5  |              |     | 5        | 2.908    | 7.505        | -58.877 |
| 6  | 1            | M2  | 1        | 14.997   | 7.685        | 85.073  |
| 7  |              |     | 2        | 14.997   | 7.685        | 48.492  |
| 8  |              |     | 3        | 14.997   | 7.685        | 11.911  |
| 9  |              |     | 4        | 14.997   | 7.685        | -24.671 |
| 10 |              |     | 5        | 14.997   | 7.685        | -61.252 |
| 11 | 1            | M3  | 1        | 7.685    | -5.518       | -58.877 |
| 12 |              |     | 2        | 7.685    | -5.781       | -30.807 |
| 13 |              |     | 3        | 7.685    | -6.044       | -1.429  |
| 14 |              |     | 4        | 7.685    | -6.308       | 29.257  |
| 15 |              |     | 5        | 7.685    | -6.571       | 61.252  |

Tukwila, WA 046-0005

Date and Time: 10/11/2007 11:06:20 AM

MCE Parameters - Conterminous 48 States

Zip Code - 98188 Central Latitude = 47.447736

Central Longitude = -122.273462

Data are based on the 0.10 deg grid set

Period SA

(sec) (%g)

0.2 133.7 Map Value, Soil Factor of 1.0 =  $S_s$

1.0 046.0 Map Value, Soil Factor of 1.0 =  $S_1$

MCE Parameters x Specified Soil Factors

0.2 133.7 Soil Factor of 1.00 x  $2/3 = S_{D5} = .089$

1.0 070.8 Soil Factor of 1.54 x  $2/3 = S_{D1} = 0.472$

SEISMIC OCCUPANCY "II"

SITE CLASS "D" ASSUMED

SEISMIC DESIGN CATEGORY "D"

# Load Tables/Snow (115%)

Allowable Uniform Load (plf)

# Pitched TJS™ Series

### 16" Wall Depth

| Span | Depth at Ridge |     |     |     |     |     |     |     |
|------|----------------|-----|-----|-----|-----|-----|-----|-----|
|      | 28"            | 32" | 36" | 40" | 44" | 48" | 52" | 56" |
| 20   | 451            | 455 | 459 | 463 | 468 | 475 | 483 | 491 |
| 22   | 406            | 409 | 409 | 416 | 421 | 425 | 430 | 437 |
| 24   | 368            | 372 | 375 | 378 | 381 | 385 | 389 | 397 |
| 26   | 335            | 342 | 344 | 344 | 348 | 348 | 354 | 359 |
| 28   | 292            | 316 | 317 | 319 | 322 | 323 | 327 | 328 |
| 30   | 251            | 285 | 295 | 297 | 299 | 300 | 302 | 304 |
| 32   | 221            | 251 | 276 | 277 | 278 | 280 | 281 | 284 |
| 34   | 196            | 221 | 247 | 259 | 261 | 262 | 263 | 265 |
| 36   | 175            | 198 | 220 | 242 | 246 | 246 | 248 | 248 |
| 38   | 157            | 177 | 197 | 217 | 231 | 233 | 234 | 234 |
| 40   | 142            | 160 | 180 | 196 | 213 | 220 | 221 | 222 |
| 42   | 128            | 145 | 162 | 177 | 192 | 209 | 210 | 211 |
| 44   | 117            | 132 | 147 | 162 | 177 | 190 | 195 | 196 |
| 46   | 106            | 121 | 135 | 148 | 161 | 174 | 182 | 188 |
| 48   | 93             | 111 | 123 | 135 | 148 | 160 | 168 | 177 |
| 50   | 83             | 102 | 114 | 125 | 136 | 147 | 157 | 163 |
| 52   | 74             | 92  | 105 | 115 | 125 | 135 | 146 | 154 |
| 54   | 66             | 82  | 98  | 107 | 117 | 125 | 135 | 142 |
| 56   | 59             | 74  | 90  | 100 | 108 | 117 | 125 | 135 |
| 58   | 53             | 67  | 81  | 93  | 101 | 109 | 116 | 126 |
| 60   | 48             | 60  | 73  | 87  | 94  | 102 | 109 | 116 |
| 62   | 44             | 55  | 67  | 79  | 88  | 96  | 102 | 110 |
| 64   | 40             | 50  | 61  | 72  | 83  | 89  | 96  | 102 |
| 66   | 37             | 45  | 55  | 66  | 77  | 84  | 90  | 96  |
| 68   | 34             | 42  | 51  | 60  | 71  | 79  | 85  | 90  |
| 70   | 31             | 38  | 46  | 56  | 65  | 75  | 80  | 86  |

### 20" Wall Depth

| Span | Depth at Ridge |     |     |     |     |     |     |     |
|------|----------------|-----|-----|-----|-----|-----|-----|-----|
|      | 28"            | 32" | 36" | 40" | 44" | 48" | 52" | 56" |
| 20   | 463            | 464 | 471 | 473 | 477 | 482 | 487 | 491 |
| 22   | 418            | 419 | 423 | 426 | 428 | 432 | 437 | 441 |
| 24   | 381            | 381 | 384 | 387 | 389 | 391 | 391 | 399 |
| 26   | 348            | 350 | 351 | 355 | 356 | 358 | 361 | 364 |
| 28   | 300            | 324 | 324 | 327 | 329 | 330 | 332 | 334 |
| 30   | 261            | 296 | 301 | 303 | 305 | 306 | 307 | 309 |
| 32   | 229            | 259 | 281 | 282 | 285 | 286 | 287 | 288 |
| 34   | 203            | 230 | 256 | 265 | 267 | 268 | 269 | 269 |
| 36   | 181            | 205 | 228 | 249 | 251 | 252 | 253 | 253 |
| 38   | 162            | 184 | 205 | 226 | 236 | 236 | 239 | 239 |
| 40   | 146            | 166 | 185 | 203 | 222 | 225 | 226 | 226 |
| 42   | 133            | 151 | 168 | 186 | 201 | 213 | 215 | 215 |
| 44   | 121            | 137 | 153 | 170 | 184 | 198 | 204 | 205 |
| 46   | 111            | 125 | 140 | 154 | 167 | 181 | 188 | 195 |
| 48   | 103            | 115 | 128 | 141 | 154 | 167 | 179 | 182 |
| 50   | 93             | 106 | 118 | 130 | 142 | 153 | 164 | 170 |
| 52   | 82             | 98  | 109 | 120 | 131 | 141 | 152 | 158 |
| 54   | 74             | 91  | 102 | 112 | 121 | 131 | 141 | 151 |
| 56   | 66             | 83  | 94  | 104 | 113 | 122 | 131 | 140 |
| 58   | 60             | 74  | 88  | 97  | 105 | 114 | 122 | 131 |
| 60   | 54             | 67  | 82  | 90  | 98  | 106 | 114 | 121 |
| 62   | 49             | 61  | 74  | 85  | 92  | 99  | 107 | 114 |
| 64   | 45             | 56  | 67  | 79  | 86  | 93  | 100 | 107 |
| 66   | 41             | 51  | 62  | 73  | 81  | 88  | 94  | 100 |
| 68   | 37             | 47  | 56  | 67  | 77  | 83  | 89  | 95  |
| 70   | 33             | 43  | 52  | 62  | 72  | 78  | 84  | 89  |

### 24" Wall Depth

| Span | Depth at Ridge |     |     |     |     |     |     |     |
|------|----------------|-----|-----|-----|-----|-----|-----|-----|
|      | 28"            | 32" | 36" | 40" | 44" | 48" | 52" | 56" |
| 20   | 472            | 477 | 482 | 484 | 487 | 490 | 493 | 495 |
| 22   | 426            | 429 | 435 | 437 | 440 | 444 | 445 | 450 |
| 24   | 387            | 388 | 393 | 395 | 397 | 399 | 400 | 406 |
| 26   | 353            | 356 | 359 | 362 | 363 | 365 | 365 | 365 |
| 28   | 299            | 329 | 331 | 334 | 335 | 336 | 338 | 338 |
| 30   | 267            | 303 | 308 | 309 | 311 | 312 | 313 | 314 |
| 32   | 233            | 258 | 286 | 289 | 290 | 291 | 292 | 292 |
| 34   | 206            | 236 | 264 | 270 | 272 | 272 | 273 | 274 |
| 36   | 186            | 210 | 236 | 254 | 255 | 256 | 257 | 258 |
| 38   | 167            | 190 | 212 | 235 | 241 | 242 | 242 | 243 |
| 40   | 151            | 172 | 193 | 212 | 226 | 229 | 229 | 230 |
| 42   | 137            | 156 | 175 | 192 | 207 | 217 | 218 | 218 |
| 44   | 125            | 142 | 159 | 174 | 190 | 200 | 207 | 208 |
| 46   | 113            | 129 | 146 | 159 | 175 | 187 | 194 | 198 |
| 48   | 105            | 119 | 133 | 147 | 160 | 174 | 181 | 188 |
| 50   | 95             | 110 | 123 | 136 | 148 | 158 | 171 | 178 |
| 52   | 88             | 101 | 114 | 125 | 137 | 146 | 159 | 164 |
| 54   | 81             | 94  | 105 | 115 | 126 | 136 | 147 | 155 |
| 56   | 73             | 88  | 98  | 107 | 117 | 126 | 137 | 146 |
| 58   | 66             | 81  | 90  | 101 | 110 | 117 | 128 | 136 |
| 60   | 60             | 74  | 86  | 94  | 102 | 110 | 119 | 126 |
| 62   | 54             | 67  | 80  | 88  | 95  | 103 | 111 | 118 |
| 64   | 49             | 61  | 74  | 82  | 89  | 96  | 104 | 110 |
| 66   | 45             | 56  | 67  | 77  | 84  | 91  | 96  | 104 |
| 68   | 41             | 51  | 62  | 72  | 80  | 87  | 92  | 98  |
| 70   | 37             | 47  | 57  | 67  | 75  | 81  | 86  | 92  |

### 28" Wall Depth

| Span | Depth at Ridge |     |     |     |     |     |     |     |
|------|----------------|-----|-----|-----|-----|-----|-----|-----|
|      | 36"            | 40" | 44" | 48" | 52" | 56" | 60" | 64" |
| 20   | 490            | 490 | 493 | 499 | 502 | 512 | 510 | 510 |
| 22   | 440            | 444 | 447 | 449 | 452 | 462 | 460 | 460 |
| 24   | 397            | 402 | 405 | 407 | 409 | 412 | 410 | 410 |
| 26   | 364            | 367 | 370 | 372 | 373 | 373 | 376 | 378 |
| 28   | 336            | 338 | 341 | 342 | 344 | 344 | 338 | 338 |
| 30   | 312            | 314 | 316 | 317 | 318 | 320 | 318 | 318 |
| 32   | 287            | 291 | 294 | 296 | 297 | 298 | 299 | 298 |
| 34   | 269            | 273 | 275 | 277 | 278 | 277 | 277 | 280 |
| 36   | 230            | 256 | 259 | 260 | 261 | 262 | 259 | 259 |
| 38   | 217            | 236 | 243 | 245 | 246 | 247 | 247 | 242 |
| 40   | 194            | 217 | 230 | 232 | 233 | 234 | 234 | 234 |
| 42   | 176            | 195 | 212 | 220 | 221 | 221 | 221 | 221 |
| 44   | 161            | 177 | 193 | 205 | 207 | 211 | 210 | 210 |
| 46   | 147            | 164 | 177 | 194 | 200 | 200 | 201 | 200 |
| 48   | 135            | 149 | 162 | 178 | 186 | 192 | 191 | 191 |
| 50   | 124            | 139 | 150 | 163 | 176 | 178 | 180 | 180 |
| 52   | 115            | 127 | 139 | 151 | 163 | 169 | 174 | 175 |
| 54   | 107            | 119 | 128 | 140 | 151 | 158 | 163 | 164 |
| 56   | 99             | 109 | 121 | 131 | 140 | 150 | 154 | 157 |
| 58   | 92             | 104 | 112 | 121 | 130 | 138 | 144 | 147 |
| 60   | 86             | 97  | 105 | 113 | 122 | 131 | 135 | 140 |
| 62   | 81             | 91  | 98  | 107 | 114 | 123 | 128 | 132 |
| 64   | 76             | 84  | 93  | 100 | 106 | 115 | 120 | 125 |
| 66   | 71             | 79  | 86  | 92  | 100 | 108 | 113 | 118 |
| 68   | 67             | 74  | 81  | 89  | 95  | 101 | 107 | 112 |
| 70   | 61             | 70  | 76  | 84  | 89  | 95  | 101 | 106 |

### 32" Wall Depth

| Span | Depth at Ridge |     |     |     |     |     |     |     |
|------|----------------|-----|-----|-----|-----|-----|-----|-----|
|      | 40"            | 44" | 48" | 52" | 56" | 60" | 64" | 68" |
| 20   | 492            | 498 | 451 | 449 | 412 | 405 | 405 | 382 |
| 22   | 447            | 447 | 451 | 449 | 412 | 405 | 405 | 382 |
| 24   | 409            | 410 | 412 | 414 | 412 | 389 | 389 | 379 |
| 26   | 372            | 375 | 376 | 378 | 380 | 386 | 389 | 357 |
| 28   | 344            | 348 | 344 | 347 | 349 | 351 | 354 | 357 |
| 30   | 319            | 320 | 322 | 322 | 326 | 322 | 322 | 322 |
| 32   | 296            | 298 | 298 | 300 | 301 | 302 | 296 | 274 |
| 34   | 278            | 279 | 280 | 280 | 280 | 282 | 283 | 274 |
| 36   | 256            | 263 | 263 | 264 | 260 | 260 | 260 | 262 |
| 38   | 242            | 243 | 245 | 249 | 249 | 249 | 239 | 239 |
| 40   | 212            | 232 | 235 | 235 | 235 | 236 | 234 | 234 |
| 42   | 199            | 214 | 218 | 223 | 223 | 223 | 223 | 221 |
| 44   | 180            | 198 | 205 | 210 | 213 | 212 | 212 | 207 |
| 46   | 166            | 181 | 197 | 202 | 200 | 203 | 199 | 199 |
| 48   | 152            | 167 | 182 | 187 | 192 | 193 | 193 | 188 |
| 50   | 141            | 152 | 166 | 176 | 182 | 185 | 184 | 179 |
| 52   | 130            | 143 | 154 | 164 | 171 | 176 | 169 | 166 |
| 54   | 121            | 131 | 142 | 154 | 160 | 166 | 166 | 161 |
| 56   | 110            | 121 | 133 | 142 | 150 | 156 | 156 | 153 |
| 58   | 103            | 113 | 123 | 132 | 141 | 147 | 150 | 145 |
| 60   | 97             | 105 | 116 | 124 | 133 | 139 | 143 | 138 |
| 62   | 91             | 99  | 109 | 116 | 125 | 131 | 136 | 132 |
| 64   | 85             | 93  | 102 | 109 | 116 | 124 | 126 | 125 |
| 66   | 80             | 87  | 95  | 103 | 111 | 116 | 121 | 120 |
| 68   | 75             | 82  | 89  | 97  | 104 | 109 | 115 | 113 |
| 70   | 71             | 78  | 84  | 91  | 98  | 104 | 109 | 108 |

### 36" Wall Depth

| Span | Depth at Ridge |     |     |     |     |     |     |     |
|------|----------------|-----|-----|-----|-----|-----|-----|-----|
|      | 44"            | 48" | 52" | 56" | 60" | 64" | 68" | 72" |
| 20   | 448            | 447 | 415 | 415 | 407 | 407 | 378 | 378 |
| 22   | 448            | 447 | 415 | 415 | 407 | 407 | 376 | 378 |
| 24   | 414            | 414 | 414 | 415 | 384 | 376 | 376 | 376 |
| 26   | 378            | 379 | 384 | 384 | 384 | 360 | 343 | 343 |
| 28   | 346            | 349 | 353 | 356 | 359 | 360 | 327 | 318 |
| 30   | 322            | 323 | 324 | 324 | 331 | 333 | 327 | 316 |
| 32   | 299            | 301 | 302 | 305 | 305 | 283 | 281 | 281 |
| 34   | 279            | 279 | 281 | 285 | 287 | 283 | 266 | 255 |
| 36   | 264            | 265 | 265 | 266 | 266 | 267 | 266 | 255 |
| 38   | 249            | 250 | 250 | 246 | 241 | 241 | 239 | 239 |
| 40   | 233            | 233 | 234 | 237 | 239 | 239 | 220 | 220 |
| 42   | 219            | 221 | 221 | 223 | 223 | 220 | 220 | 200 |
| 44   | 199            | 212 | 211 | 214 | 208 | 206 | 206 | 202 |
| 46   | 183            | 199 | 202 | 202 | 204 | 199 | 199 | 191 |
| 48   | 170            | 183 | 191 | 193 | 192 | 190 | 189 | 176 |
| 50   | 156            | 168 | 182 | 186 | 182 | 180 | 179 | 174 |
| 52   | 145            | 155 | 167 | 173 | 179 | 174 | 169 | 163 |
| 54   | 133            | 144 | 155 | 163 | 167 | 166 | 161 | 155 |
| 56   | 12             |     |     |     |     |     |     |     |

# DESIGN PROPERTIES

## Allowable Design Properties<sup>(1)</sup> (100% Load Duration)

| Grade                    | Width   | Design Property                       | Depth  |        |                          |        |        |        |        |         |         |        |        |        |     |
|--------------------------|---------|---------------------------------------|--------|--------|--------------------------|--------|--------|--------|--------|---------|---------|--------|--------|--------|-----|
|                          |         |                                       | 4 1/4" | 5 1/2" | 5 1/2" Plank Orientation | 7 1/4" | 8 1/4" | 9 1/4" | 9 1/2" | 11 1/4" | 11 1/2" | 14"    | 16"    | 18"    | 20" |
| <b>TimberStrand® LSL</b> |         |                                       |        |        |                          |        |        |        |        |         |         |        |        |        |     |
| 1.3E                     | 3 1/2"  | Moment (ft-lbs)                       | 1,735  | 2,685  | 1,780                    | 4,550  | 6,335  | 7,240  |        | 10,520  |         |        |        |        |     |
|                          |         | Shear (lbs)                           | 4,085  | 5,135  | 1,925                    | 6,765  | 8,050  | 8,635  |        | 10,509  |         |        |        |        |     |
|                          |         | Moment of Inertia (in. <sup>4</sup> ) | 24     | 49     | 20                       | 111    | 187    | 231    |        | 415     |         |        |        |        |     |
|                          |         | Weight (plf)                          | 4.5    | 5.6    | 5.6                      | 7.4    | 8.8    | 9.4    |        | 11.5    |         |        |        |        |     |
| 1.55E                    | 1 3/4"  | Moment (ft-lbs)                       |        |        |                          |        |        |        | 5,210  |         | 7,975   | 10,920 |        |        |     |
|                          |         | Shear (lbs)                           |        |        |                          |        |        |        | 3,435  |         | 4,295   | 5,065  |        |        |     |
|                          |         | Moment of Inertia (in. <sup>4</sup> ) |        |        |                          |        |        |        | 125    |         | 244     | 400    |        |        |     |
|                          |         | Weight (plf)                          |        |        |                          |        |        |        | 5.2    |         | 6.5     | 7.7    |        |        |     |
|                          | 3 1/2"  | Moment (ft-lbs)                       |        |        |                          |        |        |        | 10,420 |         | 15,955  | 21,840 |        |        |     |
|                          |         | Shear (lbs)                           |        |        |                          |        |        |        | 6,870  |         | 8,590   | 10,125 |        |        |     |
|                          |         | Moment of Inertia (in. <sup>4</sup> ) |        |        |                          |        |        |        | 250    |         | 488     | 800    |        |        |     |
|                          |         | Weight (plf)                          |        |        |                          |        |        |        | 10.4   |         | 13      | 15.3   |        |        |     |
| <b>Microlam® LVL</b>     |         |                                       |        |        |                          |        |        |        |        |         |         |        |        |        |     |
| 1.9E                     | 1 3/4"  | Moment (ft-lbs)                       |        | 2,125  | 3,555                    | 5,600  | 5,885  | 8,070  | 8,925  | 12,130  | 15,555  | 19,375 | 23,580 |        |     |
|                          |         | Shear (lbs)                           |        | 1,830  | 2,410                    | 3,075  | 3,160  | 3,740  | 3,950  | 4,655   | 5,320   | 5,985  | 6,650  |        |     |
|                          |         | Moment of Inertia (in. <sup>4</sup> ) |        | 24     | 56                       | 115    | 125    | 208    | 244    | 400     | 597     | 851    | 1,165  |        |     |
|                          |         | Weight (plf)                          |        | 2.8    | 3.7                      | 4.7    | 4.8    | 5.7    | 6.1    | 7.1     | 8.2     | 9.2    | 10.2   |        |     |
| <b>Parallam® PSL</b>     |         |                                       |        |        |                          |        |        |        |        |         |         |        |        |        |     |
| 2.0E                     | 2 1/16" | Moment (ft-lbs)                       |        |        |                          |        |        | 9,535  | 10,025 | 13,800  | 15,280  | 20,855 | 26,840 | 33,530 |     |
|                          |         | Shear (lbs)                           |        |        |                          |        |        | 4,805  | 4,935  | 5,845   | 6,170   | 7,275  | 8,315  | 9,350  |     |
|                          |         | Moment of Inertia (in. <sup>4</sup> ) |        |        |                          |        |        | 175    | 192    | 319     | 375     | 615    | 917    | 1,305  |     |
|                          |         | Weight (plf)                          |        |        |                          |        |        | 7.8    | 8.0    | 9.5     | 10.0    | 11.8   | 13.4   | 15.1   |     |
|                          | 3 1/2"  | Moment (ft-lbs)                       |        |        |                          |        |        | 12,415 | 13,055 | 17,970  | 19,900  | 27,160 | 34,955 | 43,665 |     |
|                          |         | Shear (lbs)                           |        |        |                          |        |        | 6,260  | 6,430  | 7,615   | 8,035   | 9,475  | 10,825 | 12,180 |     |
|                          |         | Moment of Inertia (in. <sup>4</sup> ) |        |        |                          |        |        | 231    | 250    | 415     | 488     | 800    | 1,195  | 1,701  |     |
|                          |         | Weight (plf)                          |        |        |                          |        |        | 10.1   | 10.4   | 12.3    | 13.0    | 15.3   | 17.5   | 19.7   |     |
|                          | 5 1/2"  | Moment (ft-lbs)                       |        |        |                          |        |        | 18,625 | 19,585 | 26,955  | 29,855  | 40,740 | 52,430 | 65,495 |     |
|                          |         | Shear (lbs)                           |        |        |                          |        |        | 9,390  | 9,645  | 11,420  | 12,055  | 14,210 | 16,240 | 18,270 |     |
|                          |         | Moment of Inertia (in. <sup>4</sup> ) |        |        |                          |        |        | 346    | 375    | 623     | 733     | 1,201  | 1,792  | 2,552  |     |
|                          |         | Weight (plf)                          |        |        |                          |        |        | 15.2   | 15.6   | 18.5    | 19.5    | 23.0   | 26.3   | 29.5   |     |
|                          | 7"      | Moment (ft-lbs)                       |        |        |                          |        |        | 24,830 | 26,115 | 35,940  | 39,805  | 54,325 | 69,905 | 87,325 |     |
|                          |         | Shear (lbs)                           |        |        |                          |        |        | 12,520 | 12,855 | 15,225  | 16,070  | 18,945 | 21,655 | 24,360 |     |
|                          |         | Moment of Inertia (in. <sup>4</sup> ) |        |        |                          |        |        | 462    | 500    | 831     | 977     | 1,601  | 2,389  | 3,402  |     |
|                          |         | Weight (plf)                          |        |        |                          |        |        | 20.2   | 20.8   | 24.6    | 26.0    | 30.6   | 35.0   | 39.4   |     |

(1) For product in beam orientation, unless otherwise noted.

### TimberStrand® LSL Grade Verification

TimberStrand® LSL is available in more than one grade. The product will be stamped with its grade information, as shown in the examples below. With the 1.55E TimberStrand® LSL Beam, larger holes can be drilled through the beam. See Allowable Holes on page 36.

**TRUS JOIST**  
TimberStrand

## 1.3E WINDOW & DOOR

ICCES ESR-1387  
CCMC 12627-R  
HUD 1265

**TRUS JOIST**  
TimberStrand

## ROUND HOLE ZONE

NO holes within 8" of beam ends

1.55E  
HUD 1265  
CCMC 12627-R  
ICCES ESR-1387

05-30-04-1

p39

# TJM™ TRUSS ALLOWABLE UNIFORM LOAD TABLE (PLF) / PARALLEL CHORD

For economical truss design, see page 5.

| Span | Depth      |            |            |            |            |            |            |            |            |            |            |            |            |            |
|------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|      | 20"        | 22"        | 24"        | 26"        | 28"        | 30"        | 32"        | 34"        | 36"        | 38"        | 40"        | 42"        | 44"        | 46"        |
| 24'  | 323<br>186 | 356<br>356 | 328<br>228 | 356<br>356 | 328<br>273 | 356<br>356 | 328<br>327 | 356<br>356 | 328<br>329 | 356<br>355 | 328<br>355 | 356<br>355 | 328<br>356 | 356<br>355 |
| 26'  | 275<br>147 | 316<br>329 | 303<br>183 | 329<br>329 | 303<br>221 | 329<br>329 | 303<br>257 | 329<br>329 | 303<br>329 | 329<br>329 | 303<br>329 | 329<br>329 | 303<br>329 | 329<br>329 |
| 28'  | 237<br>120 | 273<br>280 | 265<br>148 | 305<br>305 | 282<br>177 | 305<br>305 | 282<br>207 | 305<br>285 | 282<br>200 | 305<br>285 | 282<br>200 | 305<br>285 | 282<br>200 | 305<br>285 |
| 30'  | 202<br>98  | 238<br>258 | 231<br>120 | 266<br>284 | 256<br>146 | 285<br>285 | 263<br>175 | 285<br>285 | 263<br>200 | 285<br>285 | 263<br>200 | 285<br>285 | 263<br>200 | 285<br>285 |
| 32'  | 182<br>81  | 209<br>224 | 203<br>100 | 234<br>254 | 224<br>121 | 258<br>268 | 246<br>142 | 268<br>268 | 247<br>170 | 268<br>268 | 247<br>170 | 268<br>268 | 247<br>268 | 268<br>268 |
| 34'  | 161<br>67  | 185<br>201 | 180<br>84  | 207<br>224 | 199<br>101 | 229<br>249 | 218<br>218 | 252<br>252 | 232<br>141 | 252<br>252 | 232<br>141 | 252<br>252 | 232<br>141 | 252<br>252 |
| 36'  | 143<br>57  | 165<br>179 | 160<br>71  | 184<br>200 | 177<br>86  | 204<br>222 | 194<br>102 | 223<br>238 | 211<br>120 | 238<br>238 | 220<br>138 | 238<br>238 | 220<br>138 | 238<br>238 |
| 38'  | 121<br>48  | 148<br>155 | 144<br>60  | 166<br>180 | 159<br>74  | 183<br>199 | 174<br>87  | 201<br>218 | 190<br>103 | 218<br>224 | 205<br>119 | 226<br>226 | 208<br>208 | 226<br>226 |
| 40'  | 103<br>41  | 133<br>133 | 130<br>52  | 149<br>162 | 144<br>63  | 165<br>179 | 157<br>76  | 181<br>197 | 171<br>88  | 197<br>214 | 185<br>102 | 213<br>215 | 198<br>198 | 215<br>215 |
| 42'  | 89<br>36   | 115<br>115 | 112<br>45  | 135<br>144 | 130<br>54  | 150<br>163 | 143<br>65  | 166<br>178 | 155<br>77  | 178<br>194 | 168<br>90  | 193<br>204 | 180<br>204 | 193<br>204 |
| 44'  | 77<br>31   | 101<br>101 | 97<br>39   | 123<br>125 | 118<br>47  | 136<br>148 | 130<br>56  | 150<br>163 | 141<br>67  | 163<br>177 | 153<br>77  | 176<br>191 | 189<br>189 | 176<br>204 |
| 46'  | 67<br>27   | 88<br>88   | 84<br>34   | 110<br>110 | 104<br>42  | 125<br>134 | 119<br>49  | 137<br>149 | 129<br>58  | 149<br>162 | 140<br>68  | 161<br>172 | 178<br>187 | 188<br>187 |
| 48'  | 78<br>78   | 75<br>30   | 97<br>97   | 91<br>37   | 115<br>108 | 109<br>44  | 126<br>137 | 119<br>51  | 137<br>149 | 128<br>60  | 148<br>161 | 170<br>172 | 188<br>179 | 187<br>179 |
| 50'  | 69<br>69   | 66<br>26   | 86<br>86   | 80<br>32   | 105<br>105 | 97<br>105  | 116<br>125 | 109<br>46  | 126<br>137 | 118<br>53  | 136<br>148 | 156<br>159 | 167<br>172 | 179<br>172 |
| 52'  | 61<br>61   | 76<br>76   | 72<br>29   | 93<br>93   | 86<br>34   | 107<br>112 | 86<br>41   | 107<br>127 | 109<br>47  | 126<br>137 | 118<br>55  | 136<br>148 | 156<br>159 | 172<br>172 |
| 54'  | 55<br>55   | 68<br>68   | 64<br>26   | 83<br>83   | 77<br>31   | 99<br>100  | 91<br>36   | 108<br>117 | 101<br>42  | 117<br>127 | 109<br>49  | 126<br>137 | 134<br>143 | 151<br>159 |
| 56'  | 49<br>49   | 61<br>61   | 75<br>75   | 69<br>90   | 69<br>90   | 81<br>90   | 81<br>100  | 94<br>108  | 94<br>108  | 101<br>117 | 108<br>125 | 115<br>133 | 122<br>141 | 130<br>149 |
| 58'  | 44<br>44   | 55<br>55   | 67<br>67   | 62<br>81   | 62<br>25   | 81<br>81   | 73<br>29   | 94<br>95   | 86<br>34   | 107<br>110 | 109<br>39  | 126<br>136 | 145<br>156 | 167<br>172 |
| 60'  | 40<br>40   | 50<br>50   | 61<br>61   | 73<br>73   | 66<br>26   | 86<br>86   | 77<br>31   | 94<br>100  | 88<br>36   | 102<br>110 | 109<br>41  | 126<br>136 | 145<br>156 | 167<br>172 |
| 62'  |            | 45<br>45   | 55<br>55   | 66<br>66   | 78<br>78   | 88<br>88   | 81<br>81   | 95<br>103  | 88<br>37   | 102<br>111 | 109<br>42  | 126<br>136 | 145<br>156 | 167<br>172 |
| 64'  |            | 41<br>41   | 50<br>50   | 60<br>60   | 71<br>71   | 83<br>83   | 73<br>29   | 96<br>96   | 83<br>33   | 102<br>104 | 109<br>42  | 126<br>136 | 145<br>156 | 167<br>172 |
| 66'  |            |            | 46<br>46   | 55<br>55   | 65<br>65   | 76<br>76   | 67<br>27   | 84<br>87   | 77<br>31   | 90<br>98   | 96<br>104  | 104<br>110 | 113<br>120 | 125<br>133 |
| 68'  |            |            | 42<br>42   | 50<br>50   | 60<br>60   | 69<br>69   | 61<br>25   | 79<br>80   | 78<br>25   | 85<br>80   | 91<br>81   | 98<br>98   | 104<br>110 | 113<br>120 |
| 70'  |            |            | 39<br>46   | 46<br>46   | 55<br>55   | 64<br>64   | 64<br>73   | 73<br>80   | 73<br>26   | 80<br>84   | 85<br>92   | 92<br>98   | 98<br>104  | 104<br>110 |

See page 4 for available depths and profiles. For depths and profiles not shown, use TJ-Beam® software or contact your iLevel Trus Joist® Commercial representative for assistance. For spans over 70 feet, see page 32 or contact your iLevel Trus Joist® Commercial representative.

## General Notes

- iLevel Trus Joist® Commercial open-web trusses will be custom designed to the specified loads. Values shown are maximum allowable load capacities based on the following assumptions:
  - Simple span, uniformly loaded conditions, with provisions for positive drainage (1/4" per foot slope minimum) in roof applications.
  - Span indicates distance from inside face to inside face of bearing plus 3".
  - Top chord S bearing clips. Higher values may be possible with other types of bearing clips.
- Straight line interpolations may be made between depths and spans.
- These tables may also be used for bottom chord bearing trusses with or without cantilevers—at one or both ends. Cantilevers are limited to 1/3 of the main span provided that the inboard shear for cantilevered conditions is limited to 4,900 lbs for TJM™ and 7,400 lbs for TJH™ truss series.
- Values in shaded areas may be increased 7% for repetitive-member use.
- Minimum concentrated load analysis of 2,000 lbs has been considered, but does not affect the values in this table.

General Notes continued on page 11



**PROJECT MANUAL  
FOR  
McDONALD'S STANDARD BUILDING  
PROGRAM**



RECEIVED  
CITY OF TUKWILA

APR 30 2008

PERMIT CENTER

D08-243

# **PROJECT MANUAL FOR 2008 BUILDING PROGRAM**



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Issue date January 2008**

## GENERAL CONDITIONS

GC-1 McDonald's Corporation or any of its subsidiaries, is hereinafter referred to as "McDonald's", whose home address is McDonald's USA, LLC, Kroc Drive, Oak Brook, Illinois 60523.

### GC-2 PLANS AND SPECIFICATIONS

- A. These specifications and the accompanying Drawings are intended to describe and provide for a finished piece of work. They are intended to be cooperative, and what is called for by either shall be as binding as if called for by both. The Contractor shall understand that the work herein described shall be complete in every detail, notwithstanding every item necessarily involved is not specifically mentioned, and the Contractor will be held to provide all labor and materials necessary for the entire completion of the work intended to be desired, and shall not avail himself of any manifestly unintentional error or omission should such exist. Should any error or omission or inconsistency appear in Drawings or Specifications, or if the Contractor or its' Sub-Contractor require any clarification, the Contractor, before proceeding with the Work, shall make mention of the same to McDonald's Area Construction Manager in writing for proper adjustment, and in no case should he proceed with the Work in uncertainty.
- B. Titles to chapters (Sections) and paragraphs (Articles) in these Specifications are indicated merely for convenience and shall not be construed as a correct or complete segregation of the several units of materials and labor. McDonald's assumes no responsibility, either direct or implied, for omissions or duplications by the Contractor or his Sub-Contractor(s), due to real or alleged error in arrangement of matter in these Specifications.
- C. It shall be the duty of the Contractor to verify all dimensions given on Drawings and to report any errors, omissions, inconsistencies or questions to the Area Construction Manager before commencing the work. In submitting a proposal it will be construed by McDonald's that the bidder has examined and familiarized himself with the site and has carefully checked all the details and assured himself that they conform in every respect with both local and state requirements. Ignorance or failure on part of the Contractor or Sub-Contractor to examine or familiarize them self with the site will not be accepted as an excuse for claims to extra or additional payment above contract price.
- D. The Area Construction Manager shall, within a reasonable time, make decisions on all points and answer all questions raised by the Contractor, on matters relating to the interpretation of Drawings, Specifications and the execution and the progress of the Work.
- E. Should any dispute arise as to the quality or fitness of materials, workmanship, or interpretation of the Contract Documents, the decisions shall rest with the Area Construction Manager and shall be based on the requirements that all work done and all materials furnished shall be in strict accordance with the Contract Documents and what is usual, customary, and standard practice in erecting buildings or similar type. All products that are specified to be used on the project shall be used and/or installed in strict compliance with the product manufacturers written specifications and instructions.
- F. Where necessary for field work, or proper interpretation of the Contract Documents, the Contractor shall submit with such promptness as to cause no delay in his or any other Contractor's work, three copies of amplified details and schedules for the approval of the Area Construction Manager and shall furnish the Area Construction Manager three copies of the final details, one to be returned to the Contractor approved and two to remain in the Area Construction Manager's files.
- G. Figured dimensions and detailed drawings shall be followed in preference to scaled measurements. In case of any doubt on the part of the Contractor as to the exact meaning of the drawings and these specifications, he shall apply to the Area Construction Manager for an interpretation before proceeding with his work.
- H. Should discrepancies appear among the contract documents, the Contractor shall request an interpretation from the Area Construction Manager before proceeding with the work. If the Contractor fails to make such a request, no excuse will thereafter be entertained for failure to carry out work in the required manner or provide required guarantees, warranties, or bonds. Should conflict occur in or between drawings and specifications, Contractor is deemed to have estimated on better quality and larger quality of work, unless he

shall have requested and obtained written decision from the Area Construction Manager before submissions of bid as to which method or materials will be required.

- I. The most current edition of the McDonald's site details and specifications are to be considered part of this Contract. It is the Contractor's responsibility to obtain a copy of the current McDonald's site details and site work specifications as prepared by consulting civil engineer for the specific project from the McDonald's Regional Construction Department. In addition, the Contractor shall obtain, review and become familiar with the manufacturer's specifications applicable to the product and materials to be used and or incorporated into the Work.

**GC-3 MATERIALS, LABOR, APPLIANCES:**

- A. Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light and power, transportation and other facilities necessary for the execution of the Work.
- B. Unless otherwise specified, all materials shall be new and both workmanship and materials shall be the best of these respective kinds. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.
- C. None but satisfactory foremen and workmen shall be employed on the Work, and when required by McDonald's, the Contractor shall discharge and shall not re-employ on the Work, any person who commits trespass, or who is in the opinion of McDonald's, disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable, nor shall he employ any person who has been discharged by another Contractor upon the order of the Area Construction Manager.
- D. Unless otherwise stipulated, no allowance or compensation whatsoever shall be due or paid to the Contractor for any temporary roads, excavations, embankments, or other work or structures that he may make to facilitate his work, nor for any construction plant, tools or equipment which may be required in the performance of the Work.
- E. All work and materials delivered on the premises shall be intended to form part of the Work and shall not be removed without consent of McDonald's, but the Contractor shall have the right to remove all surplus materials after the completion of all Work included in his Contract.
- F. It shall be the duty of the Contractor to see that all Sub-Contractors are fully informed in regard to the general conditions and specifications.
- G. The Contractor shall post and maintain all applicable Material Safety Data Sheets on the Job site in compliance with applicable laws and regulations.

**GC-4 LOCATION AND GRADES:**

- A. The exact property lines corner monuments (bench marks) set by our surveyor and grades will be furnished to the Contractor and all precautions shall be taken by the Contractor to preserve same. If any are displaced, lost or disturbed through the act or neglect of the Contractor or his agents or employees, he shall pay for cost of restoration.
- B. The relation of the building to the lot lines and established city grades shall be as shown on Drawings. The Contractor shall accurately lay out his work on the ground according to Drawings furnished, and will be held responsible for the correct location of all Work on the premises.

**GC-5 PROTECTION OF WORK AND PROPERTY:**

- A. The Contractor shall be responsible for all violations of city codes, ordinances, and state laws involved in the performance of his Work; and for obstruction of streets, sidewalks, alleys, and pavements, and shall in all cases make good any damage to any streets, sidewalks, alleys and pavements. He shall use every precaution to brace and otherwise support and secure the structural frame, walls, floors and roof during the construction of the work; and shall provide, during the progress of his work, every and all safeguards and protection against accidents, injury and damage to persons and property including adjoining property. The Contractor shall be responsible for his work and every part thereof, and for all materials, tools, appliances and property of every description used in connection therewith.

- B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
1. Locate fire extinguishers where convenient and effective for their intended purpose.
  2. Store combustible materials in containers in fire-safe locations.
  3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
  4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- C. HOT WORK: Where Work involves the use of flame, spark or hot ember producing equipment, such as but not limited to, welding, blow torches and metal grinding type equipment and equipment using internal combustion engines ("Hot Work"). In order to prevent the potential for fires, Hot Work safety procedures must be followed that include, but shall not be limited to, the following elements: Pre-work inspection of the area to identify and minimize the presence of combustible or flammable materials, the use of flame resistant building surface coverings such as welding blankets and fire retardant tarpaulins (tarps), in the area of hot work, damping down the area, the presence of a functional dry chemical fire extinguisher with a minimum rating of 10B-C within 10 feet of the Hot Work area, and post-work inspection of the area for any signs of smoldering or burning materials and extinguishment of these materials. The Hot Work procedures will also highlight the need for extra caution for hot work in areas on the roof, near cooking equipment ventilation exhaust systems. These Hot Work procedures will be planned for, initiated and monitored through the use of written Hot Work permit, which will be signed by both the designated job site supervisor and the person before doing the hot work. The Hot Work permit shall be posted in the work area and be retained for at least one month by the job site supervisor.
- C. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
- D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- E. Enclosure Fence (if required): Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
- F. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- G. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-producing tools and equipment to hours that will minimize complaints from persons or firms near the site. The Contractor shall not use any fill or other materials to be incorporated into the Work that contain asbestos, are hazardous, toxic or are made up of materials that are hazardous or toxic materials as defined from time to time by applicable federal or state laws, rules, and regulations.
- H. Electrical Certification: Upon completion of any electrical wiring (which must be performed by a qualified electrician), Contractor shall cause the Electrical Contractor to complete the electrician checklist and visual guide for POS and deliver to Agent, a fully executed original Electrical Certification (on McDonald's Form) which has been properly signed by both Contractor and Electrical Contractor prior to installation of the POS system. Any changes made to the electrical system after the POS certification process has been completed shall require system re-certification.

GC-6 INSPECTION:

- A. The Area Construction Manager shall at all times have access to the Work wherever it is in preparation or progress, and the Contractor shall provide proper facilities to inspect the Work in a safe manner.
- B. If the Specifications, the Area Construction Manager's instructions, laws, ordinances or any public authority require any work to be specially tested or approved, the Contractor shall give the proper authorities timely notice of its readiness for inspection. If any such work should be covered up without approval or consent, it must, if required by the proper authorities, be uncovered for examination at the Contractor's expense and remain uncovered until properly and successfully tested.
- C. The Area Construction Manager may require special testing or inspections beyond the scope of the Drawings, Specifications, or local codes. If the result of the tests or special inspection meet the standards required by Drawings or Specifications, McDonald's shall bear the cost of such tests or inspections. If the results do not meet the standards required by Drawings, Specifications, or local codes, the Contractor shall bear the cost of such tests and inspections.

**GC-7 SUPERVISION:**

- A. The Contractor shall give personal supervision to the Work, using his best skill and attention, and shall keep a competent Foreman and any necessary assistants constantly on the job site. The Foreman shall be the personal representative of the Contractor and all directions given by him shall be as binding as if given by the Contractor. Communication delivered to the Foreman by the Area Construction Manager shall be as binding as if delivered by the Contractor.
- B. The Contractor shall carefully study and compare all Drawings, Specifications, and other instructions, and where dimensions are governed by existing conditions or by conditions already established, he shall make actual measurements himself and shall report in writing to the Area Construction Manager, for explanation or adjustment, any errors, disagreements or inconsistencies in Drawings and Specifications or figured dimensions of Drawings which may exist or appear to exist, before proceeding to execute that part of the Work affected thereby, and in any case within ten days of the receipt of Drawings, Specifications and instructions. Failure to do so shall constitute a waiver of all right to or claim for extra work on such account.
- C. The Contractor, when working on an existing condition, shall prior to incorporating new work called for in the Drawings, make appropriate corrective measures to existing condition so that the installation of new is consistent to latest industry standards and meets performance requirements for Work called for.
- D. No deviation from Specifications, Drawings or instructions shall be made without prior written authorization to do the Work by the Area Construction Manager.

**GC-8 THE AREA CONSTRUCTION MANAGER'S STATUS:**

- A. The Area Construction Manager shall have general supervision and direction of the Work. He is the agent of the Owner, McDonald's Corporation, only to the extent provided in the Contract and when in special circumstances he is authorized by the Owner so to act, and in such instances he shall, upon request, show Contractor written authority. He has authority to stop the Work whenever, in his opinion, such stoppage may be necessary to insure the proper execution of the Contract.
- B. The Area Construction Manager shall within reasonable time make decisions on all points brought up by the Contractor, on matters relating to the interpretation of Drawings, Specifications and the execution and progress of the Work.

**GC-9 USE OF PREMISES BY THE OWNER AND THE CONTRACTOR:**

- A. The Contractor shall confine his apparatus; the storage of materials and the operation of his workmen to limits indicated by law, ordinances, and permits and shall not encumber the premises with his materials.
- B. The Contractor shall not load or permit any part of the structure to be loaded with a weight that may compromise the longevity or integrity of the structure or endanger its safety.
- C. All material on the job shall be so stored and handled as to preclude the inclusion of any foreign material in the Work, and to prevent damage from the weather or the ground.

- D. McDonald's may, prior to the completion of the buildings, store goods and otherwise occupy any portion thereof, which is structurally safe to occupy, and the occupation of which will not substantially interfere with, increase the cost of, or delay the Work of the Contractor.
- E. But no such occupation or use shall take place until the Contractor has given his authorization setting forth the portions to be used, and the conditions of such occupancy, and that McDonald's shall assume all responsibility for damage to the building resulting there from.
- F. Construction personnel may park on the site within the construction limits subject to Contractor's restrictions imposed to meet safety requirements and avoid interference with the progress of the Work.

GC-10 SEPARATE CONTRACTS:

- A. McDonald's reserves the right to do such Work as they shall elect and to let other contracts in connection with the Work. The Contractor shall afford other Contractors full opportunity for the installation of equipment and storage of their material, and the execution of their Work, and shall properly connect and coordinate his Work with theirs so that there will be no interference or delay in any matter with the work of the Owner or of other Contractors.

GC-11 TEMPORARY SHEDS:

- A. Contractor shall, at his own expense, provide such temporary trailers, offices, and sheds for storing of materials, tools, etc., with necessary telephones, heat, etc., all of which are to be removed by him at the completion of the job.

GC-12 TEMPORARY TOILET FACILITIES:

- A. As conditions require, the Contractor, at his own expense, shall install temporary toilet facilities for the use of his employees and governing State and Local regulations. These toilet facilities must be placed at suitable locations, enclosed against weather, maintained in proper condition, disinfected, and at completion of the job cleaned out and removed from the premises.

GC-13 TEMPORARY UTILITIES:

- A. Contractor shall make arrangements for, and furnish at his own expense, all water, gas and electricity for temporary lighting and power.
- B. Temporary Electric Power Service: Contractor, without cost to McDonald's or Sub-Contractors, shall provide and maintain all temporary electrical services for any or all Contractors, for use of apparatus, lights, or tools to facilitate the completion of the building (see Division 26 for Electrical Requirements).
- C. The Contractor shall terminate his responsibility as to utility charges, five working days after the arrival of the kitchen equipment.
  - 1. The Contractor shall have the meters read by the utility companies as of that date and pay all applicable billing charges.
  - 2. If the utility companies are unable to provide a meter reading as of the above date, the total utility billing during the time of construction will be broken down equally on a daily use basis with the Contractor paying up to the above mentioned period of days and McDonald's or its Licensee assuring all payment after that date.
  - 3. Arrange with company and existing users for a time when service can be interrupted, if necessary to make connections for temporary services.
  - 4. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
  - 5. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
  - 6. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Area Construction Manager. Neither the Owner nor the Area Construction Manager will accept cost or charges as a basis of claims for Change Orders.
- D. In the event that temporary heat during freezing weather is necessary, this Contractor shall provide for and include same in his bid, or make necessary arrangements with the several Sub-Contractors requiring temporary heat to provide for and include same in their bids. He shall make sure that proper fuels and apparatus are furnished and installed with flue pipes to the outside of the building, and that the fuels are

properly housed. Installation shall be such as to in no way damage any of the finished work or work in progress. In event of any damage, resulting from improper heating arrangements, same shall be corrected at expense of Contractor. Store HVAC system shall not be used without first obtaining the approval from the Area Construction Manager and if such permission is granted, then upon completion of the work the filters must be changed and if necessary as determined by the Area Construction Manager in his sole discretion, the furnace shall be cleaned and/or serviced.

**GC-14 CLEANING BUILDING AND PREMISES:**

- A. The Contractor shall, at all times, keep the premises free from the accumulation of construction material waste and inflammable material or rubbish caused by his employees and others during the progress of the Work. At the completion of the Work, and before final acceptance, the Contractor shall, at his own expense, clean, and remove from the premises of McDonald's and from public and private roadways, all plant debris, rubbish, tools, scaffolding, surplus materials, and excess excavated materials due to his operations, and shall leave the premises and the Work in perfect order and repair, and the building broom clean and ready for use.

**GC-15 VERIFICATION OF UNDERGROUND UTILITY IMPROVEMENTS:**

- A. The Contractor shall provide the Owner with an as-built drawing locating and describing all underground utilities located within total parcel of property. Including, but not limited to the following: gas lines, water lines, sanitary sewers, storm sewers, telephone lines, electrical lines servicing the building, as well as underground utilities going away from the building such as lines to the trash corral, site lighting, signs, culverts, septic tanks and fields, and grease traps.

**GC-16 COOPERATION:**

- A. The Contractor and Sub-Contractors shall cooperate with one another and with other Contractors and their Sub-Contractors to facilitate the general progress of all Work at the project site
- B. All Contractors and their representatives working on this project shall, at all times, prior to and during the course of their activities shall be responsible for the safety of their employees as well as others and in the care of each as representatives of their employers shall ascertain that the conditions under which they will be required to accomplish their Work are within good safety practices and meet all concerned regulations of the Occupational Safety and Hazard Act (OSHA) or other governing regulations. The beginning of Work by a Contractor shall indicate satisfaction concerning safety and full responsibility for accidents of damage. If unsatisfied, the Contractor shall institute whatever action or device necessary to render safe condition for life and property as are related to his activity. If the Work of other parties outside his organizations, upon inspection is found at any time to be unsafe, he shall stop work immediately and notify the Contractor, Area Construction Manager. The commencement of work shall indicate acceptance of these requirements.

**GC-17 CONTRACTOR - McDONALD'S LICENSEE RELATIONSHIP:**

- A. It is the Contractor's responsibility to receive all requests for change by the McDonald's licensee through the Area Construction Manager. If the Contractor proceeds with Work without written authorization from the Area Construction Manager, McDonald's Corporation will not be responsible for payment of these changes.

**END OF GENERAL CONDITIONS**





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Project Manual

for

McDonald's USA, LLC - Building Program

**PROJECT MANUAL**

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## SECTION 011000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of a McDonald's Restaurant, including but not limited to, all site work, building and finishes.
  - 1. Owner: McDonald's USA, LLC, or any of its subsidiaries, is hereinafter referred to as "McDonald's," whose home corporate address is McDonald's USA, LLC, 2111 McDonald's Drive, Oak Brook, Illinois 60523.
- B. The Work will be performed under a single prime contract, with the exception of co-banded oil site locations.
- C. Alternates: An Alternate is an amount proposed by bidders and stated on the Bid Form for certain Work defined within the Bidding Requirements that may be either added to or deducted from the Base Bid amount if the Owner elects to accept a corresponding change in either the amount of the construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.
  - 2. Coordination: Modify or adjust the affected adjacent Work as necessary to completely integrate that Work into the Project.
    - a. Include, as part of each Alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.
  - 3. Notification: Immediately following the award of the Contract, notify each party involved, in writing, of the status of each Alternate. Include whether Alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to Alternates.
  - 4. Execute accepted Alternates under the same conditions as other Work of this Contract.
  - 5. Owner will have the option to choose any or all Alternates, in any order.

#### 1.3 WORK FURNISHED AND INSTALLED UNDER OTHER CONTRACTS

- A. McDonald's reserves the right to do such work as they shall elect and to let other contracts in connection with the Work. Contractor shall afford other Contractors full opportunity for the installation of equipment and storage of their material, and the execution of their Work, and shall properly connect and coordinate his Work with theirs so that there will be no interference or delay in any matter with the work of the Owner or of other Contractors.
- B. Signage Contract is awarded by McDonald's to an approved Signage Manufacturer. The cost of this contract will be borne by the Operator. Signage Manufacturer will select a local Signage Contractor who, after securing the signage permit, will receive and be responsible for the installation of the following:
  - 1. Signage final terminations to circuit wiring provided for under Electrical Sub-Contract.
  - 2. Standard Building Design: Signature Roof, Awning/Welcome Signs, Drive-Thru Pylons, Clearance Signs with Merchandiser, "Order Here" Canopy, and "Bollard Signs." Signs are to be installed on foundations provided by Contractor with anchor bolts, conduit and wire pulled from electrical distribution panel and located as per building plot plan.
  - 3. Construct foundations with anchor bolts as detailed on Drawings provided by the Signage Manufacturer for free-standing main road signage.
  - 4. Mount the road signage on the anchor bolts provided in the foundations and connect electrical service to the signage. Contractor shall provide necessary conduit and pull all wiring from building electrical distribution panel to signage location, providing a minimum of a three-foot "pigtail."
  - 5. "Entrance," "Exit," "Drive-Thru Display Board" and "Speaker Post" signage shall be installed on foundations provided by Contractor with anchor bolts, conduit and wire pulled from electrical distribution panel and located as per building plot plan.

6. Install flagpoles on foundations provided by Contractor with anchor bolts supplied by Signage Manufacturer.
  7. Install McDonald's wall logo signage.
  8. Install McDonald's roof signage on mounting brackets provided by Contractor.
- C. Food Service Equipment, including refrigeration and beverage system contracts shall be awarded by McDonald's. Cost of these contracts will be borne by the Operator. This equipment shall be delivered for installation only at the authorization of the Area Construction Manager. Construction of building must be substantially completed by Contractor and authorization must be issued by the Area Construction Manager's to manufacturer of equipment prior to this being moved into the building.
1. Unloading and installation of the food service equipment items shall be the responsibility of the Manufacturer(s).
  2. Contractor shall unload cooler/freezer and accessories upon equipment arrival to jobsite.
- D. Seating and Décor Contract shall be awarded separately by Owner. Contractor shall coordinate his work and leave conditions and surfaces ready to receive such items to be installed by Seating and Décor Contractor.
- E. Cooperate fully with separate contractors to insure work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

#### 1.4 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limits: Confine constructions operations to contract limits indicated.
  2. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
  3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Contractor shall confine his apparatus, storage of materials, and the operation of his work-force to limits indicated by law, ordinances, permits, and shall not encumber the premises with his materials.
- D. Contractor shall not load or permit any part of the building structure to be loaded with a weight that with endanger its safety or compromise its integrity.
- E. All materials on the jobsite shall be so stored and handled to preclude the inclusion of any foreign material in the Work, and to prevent damage from exposure to weather or ground.
- F. Construction personnel shall be allowed to park vehicles within the jobsite construction limits subject to Contractors restrictions imposed to comply with safety requirements and to avoid interference with progress of the Work.

#### 1.5 OWNER'S OCCUPANCY REQUIREMENTS

- A. McDonald's may, prior to the completion of construction of the facility, store goods and otherwise occupy any portion thereof, which has been deemed structurally safe to occupy, and said occupancy will not substantially interfere with, increase the cost of, nor delay the work of the Contractor.
1. No such occupation or use shall take place until Contractor has given his written authorization setting forth the portions of the facility available for use and conditions of such occupancy. McDonald's shall assume all responsibility for damages to the facility directly resulting from partial occupancy.
  2. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.

- B. Occupancy Permit: Contractor shall obtain an occupancy permit and deliver same to Area Construction Manager at the completion of the Work.
1. Obtain and submit all pertinent operating certificates, final inspection/test reports/certificates, and similar releases that enable Owner's full and unrestricted use of the Work and full access to all services and utilities.
  2. Make final change-over of locks and transmit keys to Owner.

#### 1.6 SCOPE OF WORK - OWNER-FURNISHED PRODUCTS

- A. Contractor shall be responsible for acceptance Owner furnished products, including unloading, storage, handling, and installation in compliance with all local codes, ordinances, and normal guarantees. This work shall include the provision of any support system as required to receive Owner's equipment and mechanical and electrical connections for the following:
1. Ventilating fan units and related materials.
  2. Counter-top, supplied and installed by Kitchen Equipment Supplier (KES). If counter top is supplied by a source other than KES, Contractor shall be responsible for installation, including any accessories and supports.
  3. Heating and air conditioning equipment and related materials/accessories.
  4. Freezer/cooler, supplied and installed by KES
  5. Power/control outlet boxes
  6. Furnish and install roof-mounted equipment and refrigeration compressor pad where indicated on Drawings.
- B. Owner Furnished Products Installed by Owner: The items listed below shall be Owner furnished and installed. Contractor shall be responsible for receiving, unloading, storage, and security items on the premises until Owner is ready to perform install said items.
1. Kitchen equipment
  2. Soda system
  3. Refrigeration
  4. Seating and décor
  5. Play place equipment
- C. Owner or Area Construction Manager shall be responsible for the following:
1. Owner shall arrange for and delivery of all necessary shop drawings, product data, templates, and samples to Contractor.
  2. Owner shall arrange and pay for expenses relating to the delivery of Owner-furnished items in accordance with the Contractor's Construction Schedule.
  3. Following delivery, Area Construction Manager shall inspect Owner-furnished items for any damages.
  4. If Owner-furnished items are damaged, defective, or missing, the Operator/ Franchisee shall arrange for replacement.
  5. Owner shall be response for arranging for any required manufacturer's field services and for the delivery of manufacturer's warranties to the appropriate Contractor responsible for installation.
  6. Contractor shall coordinate and designate required delivery dates of all Owner-furnished items on the Contractor's Construction Schedule.
  7. Contractor shall review shop drawings, product data, and product samples and return Area Construction Manager with any notations regarding any anticipated discrepancies or problems associated with the use of the product and application.
  8. Contractor shall be responsible for the protection of any Owner-furnished materials from damage, including damage from exposure to the elements. Contractor shall repair or replace items damaged as a result of his operations.

#### 1.7 APPLICATION FOR PAYMENT

- A. Contractor shall review payment procedures and requirements with local McDonald's regional construction department of jurisdiction.

#### 1.8 MODIFICATION PROCEDURES

- A. Contractor shall review contract modification procedures with local McDonald's Regional Construction Department of jurisdiction prior to the commencement of construction activities.

## 1.9 PROJECT MEETINGS

- A. Contractor shall review progress and coordination meeting requirements and related procedures with the local McDonald's Regional Construction Department of jurisdiction prior to the commencement of construction activities.

## 1.10 SUBMITTALS

- A. Must go to U.S. Restaurant Development.

## 1.11 PRODUCT SUBSTITUTIONS

- A. Contractor shall review substitution policy and procedure requirements with the local McDonald's Regional Construction Department and US Restaurant Design when applicable.

## 1.12 CONTRACT CLOSEOUT

- A. Contractor shall review closeout procedure requirements with the local McDonald's Regional Construction Department of jurisdiction.

## 1.13 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat - 2004" numbering system.
  - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

## PART 2 - PRODUCTS

Not Used

## PART 3 - EXECUTION

Not Used

END OF SECTION 011000



## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Administrative and supervisory personnel.
  - 2. Project meetings.
  - 3. Requests for Interpretation (RFI's).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

#### 1.3 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

#### 1.4 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Contractor shall prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's Construction Schedule
  - 2. Preparation of the Schedule of Values
  - 3. Installation and removal of temporary facilities and controls
  - 4. Delivery and processing of submittals
  - 5. Progress meetings
  - 6. Preinstallation conferences
  - 7. Startup and adjustment of systems
  - 8. Project closeout activities

#### 1.5 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  - 1. Attendees: Inform participants and others involved, individuals whose presence is required, of date and time of each meeting. Notify Area Construction Manager of scheduled meeting dates and times.
  - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Area Construction Manager, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of McDonald's and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for RFI's.
    - g. Procedures for testing and inspecting.
    - h. Procedures for processing Applications for Payment.
    - i. Distribution of the Contract Documents.
    - j. Submittal procedures.
    - k. Use of the premises.
    - l. Work restrictions.
    - m. Owner's occupancy requirements.
    - n. Responsibility for temporary facilities and controls.
    - o. Parking availability.
    - p. Office, work, and storage areas.
    - q. Equipment deliveries and priorities.
    - r. First aid.
    - s. Security.
    - t. Progress cleaning.
    - u. Working hours.
  3. Minutes: Contractor shall record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Area Construction Manager of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents.
    - b. Options.
    - c. Related RFI's.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility problems.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written recommendations.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Required performance results.
    - v. Protection of construction and personnel.

3. Contractor shall record and distribute significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Coordinate dates of meetings with Area Construction Manager.
1. Attendees: In addition to representatives of McDonald's, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Progress cleaning.
      - 11) Quality and work standards.
      - 12) Status of correction of deficient items.
      - 13) RFI's.
      - 14) Status of proposal requests.
      - 15) Pending changes.
      - 16) Status of Change Orders.
      - 17) Documentation of information for payment requests.
  3. Minutes: Contractor shall record and distribute the meeting minutes.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

#### 1.6 REQUESTS FOR INTERPRETATION (RFI's)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified, coordinate with Area Construction Manager.
1. RFI's shall originate with Contractor. Any RFI's submitted by entities other than Contractor will be returned with no response.
  2. Coordinate and submit RFI's in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
  2. Date.
  3. Name of Contractor.
  4. Name of Architect.
  5. RFI number, numbered sequentially.
  6. Specification Section number and title and related paragraphs, as appropriate.

7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact Contract Time or Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
  - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 013100

## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

#### 1.3 DEFINITIONS

- A. **Quality-Assurance Services:** Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. **Quality-Control Services:** Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. **Mockups:** Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. **Preconstruction Testing:** Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. **Product Testing:** Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- F. **Source Quality-Control Testing:** Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. **Field Quality-Control Testing:** Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. **Testing Agency:** An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. **Installer/Applicator/Erector:** Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

#### 1.4 CONFLICTING REQUIREMENTS

- A. **General:** If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. **Minimum Quantity or Quality Levels:** Quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

#### 1.5 SUBMITTALS

- A. **Qualification Data:** For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. **Schedule of Tests and Inspections:** Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.
  - 3. Identification of applicable standards.
  - 4. Identification of test and inspection methods.
  - 5. Number of tests and inspections required.
  - 6. Time schedule or time span for tests and inspections.
  - 7. Entity responsible for performing tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.
- C. **Reports:** Prepare and submit certified written reports that include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- D. **Permits, Licenses, and Certificates:** For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

#### 1.6 QUALITY ASSURANCE

- A. **General:** Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

### 3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
  - 2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

## SECTION 017300 - EXECUTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section

#### 1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  1. Construction layout.
  2. Field engineering and surveying.
  3. General installation of products.
  4. Progress cleaning.
  5. Starting and adjusting.
  6. Protection of installed construction.
  7. Correction of the Work.

#### 1.3 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

#### 1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

### PART 2 - PRODUCTS

Not Used

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
  1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  1. Verify compatibility with and suitability of substrates, including compatibility of finishes or primers.
  2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  3. Examine walls, floors, and roofs for suitable conditions where products/ systems are to be installed.



4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction and McDonald's.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor or a professional engineer to lay out the Work using accepted surveying practices.
  1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  3. Inform installers of lines and levels to which they must comply.
  4. Check the location, level and plumb, of every major element as the Work progresses.
  5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework, as determined by McDonald's.
- D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or a professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey, as determined by McDonald's.

1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  1. Make vertical work plumb and make horizontal work level.
  2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  2. Allow for building movement, including thermal expansion and contraction.
  3. Coordinate installation of anchorages. Furnish setting drawings and templates for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully. Comply with NFPA 241 requirements for removal of combustible waste materials and debris.
  1. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
  2. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  1. Remove liquid spills promptly. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

### 3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

### 3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly; replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

## **SECTION 017329 - CUTTING AND PATCHING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes procedural requirements for cutting and patching.

#### **1.3 DEFINITIONS**

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

#### **1.4 SUBMITTALS**

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed from Architect. Include the following information:
  1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  3. Products: List products to be used and firms or entities that will perform the Work.
  4. Dates: Indicate when cutting and patching will be performed.
  5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
  6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
  7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

#### **1.5 QUALITY ASSURANCE**

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible. If identical materials are unavailable, use materials that, when installed, will match the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions in which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project exposed during cutting and patching operations.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  - 4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

## SECTION 017823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Emergency manuals.
  - 2. Operation manuals for systems, subsystems, and equipment.
  - 3. Maintenance manuals for the care and maintenance of products, materials, finishes, and systems and equipment.

#### 1.3 SUBMITTALS

- A. Manual: Submit one copy of each manual in final form at least 15 days before final inspection. Architect / U.S. Restaurant Development will return copy with comments within 15 days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

### PART 2 - PRODUCTS

#### 2.1 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.
  - 1. In addition to listed items in each individual specification section, provide system and subsystem data for manuals for the following:
    - a. Overhead power boxes
    - b. Exhaust fans
    - c. Thermostats
    - d. Energy management systems
    - e. Rooftop HVAC units and controls
    - f. Drive-thru windows
    - g. Storefront framing and glazing system
    - h. Lighting and controls
    - i. Furniture
    - j. Plumbing fixtures and controls
    - k. Equipment (kitchen)
    - l. Electrical switchgear
    - m. Electrical distribution panels
    - n. Electric hand dryers
    - o. Roofing membrane system and accessories
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name, address, and telephone number of Contractor.
  - 6. Name and address of Architect.
  - 7. Cross-reference to related systems in other operation and maintenance manuals.

- C. **Table of Contents:** List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. **Manual Contents:** Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
  - 1. **Binders:** Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper, with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
  - 2. **Dividers:** Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  - 3. **Protective Plastic Sleeves:** Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
  - 4. **Drawings:** Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.2 EMERGENCY MANUALS

- A. **Content:** Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.
- B. **Type of Emergency:** Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, flood, gas leak, water leak, power failure, water outage, and equipment failure.
- C. **Emergency Instructions:** Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. **Emergency Procedures:** Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

## 2.3 OPERATION MANUALS

- A. **Content:** In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.
- B. **Descriptions:** Include the following:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Equipment identification with serial number of each component.
  - 4. Equipment function.
  - 5. Operating characteristics.
  - 6. Limiting conditions.
  - 7. Performance curves.
  - 8. Engineering data and tests.
  - 9. Complete nomenclature and number of replacement parts.
- C. **Operating Procedures:** Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.
- D. **Systems and Equipment Controls:** Describe the sequence of operation, and diagram controls as installed.



- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.4 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning/ maintenance, and repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: General Contractor to submit Product Maintenance Manual to Area Construction Manager. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

## 2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment.
- D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions that detail essential maintenance procedures.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: General Contractor to submit Systems and Equipment Maintenance Manual to Area Construction Manager. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

- A. **Emergency Manual:** Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. **Product Maintenance Manual:** Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. **Operation and Maintenance Manuals:** Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. **Manufacturers' Data:** Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. **Drawings:** Prepare drawings if deviation from Project Record documents occurs.

END OF SECTION 017823

## SECTION 017839 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings and
  - 2. Record Product Data.
- B. Related Sections include the following:
  - 1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1) Number of Copies: Submit one set of marked-up Record Prints / Co Signed Prints, can be electronic format on CD.
- B. Record Product Data: Submit one copy of each Product Data submittal to Area Construction Manager.

### PART 2 - PRODUCTS

#### 2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
  - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
  - 2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  - 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  - 4. Note Construction Change Directive numbers, alternate numbers, Field Work Authorization forms, Change Order numbers, and similar identification, where applicable.
  - 5. Record all finish materials on final record finish schedule
- B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect / Area Construction Manager. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.
  - 1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
  - 2. Refer instances of uncertainty to Architect for resolution.
  - 3. Print the Contract Drawings and Shop Drawings for use as Record Transparencies. Area Construction Manager will make the Contract Drawings available to Contractor's print shop.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
4. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "PROJECT RECORD DRAWINGS."
  - d. Name of Architect.
  - e. Name of Contractor.

## 2.2 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders and Record Drawings where applicable.

## 2.3 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Minority spending report, where required.

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

## **SECTION 024116 - STRUCTURE DEMOLITION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Demolition and removal of buildings and site improvements.
  - 2. Removing below-grade construction.
  - 3. Disconnecting, capping or sealing, and removing site utilities.
- B. Related Sections include the following:
  - 1. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

#### **1.3 DEFINITIONS**

- A. Demolish: Completely remove and legally dispose of off-site.
- B. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

#### **1.4 MATERIALS OWNERSHIP**

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

#### **1.5 SUBMITTALS**

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit informational report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
  - 1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain.
- C. Schedule of Building Demolition Activities: Indicate the following:
  - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
  - 2. Temporary interruption of utility services.
  - 3. Shutoff and capping or re-routing of utility services.
- D. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by building demolition operations. Submit before the Work begins.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
  - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 6. Demolish and remove mockups when directed, unless otherwise indicated.

#### 1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  - 2. Payment for these services will be made from testing and inspecting allowances, paid by McDonald's.
  - 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  - 5. Submit copies of each written report directly to authorities having jurisdiction, when directed.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

- D. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  - 6. Do not perform any duties of Contractor.
  
- E. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 6. Security and protection for samples and for testing and inspecting equipment at Project site.
  
- F. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

## 1.8 SPECIAL TESTS AND INSPECTIONS

- A. **Special Tests and Inspections:** Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
  
- B. **Special Tests and Inspections:** Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
  - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
  - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  - 6. Retesting and reinspecting corrected work.

## PART 2 - PRODUCTS

Not Used

## PART 3 - EXECUTION

### 3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
  - 1. Date test or inspection was conducted.
  - 2. Description of the Work tested or inspected.
  - 3. Date test or inspection results were transmitted to Architect.
  - 4. Identification of testing agency or special inspector conducting test or inspection.

- F. **Statement of Refrigerant Recovery:** Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

#### 1.6 QUALITY ASSURANCE

- A. **Refrigerant Recovery Technician Qualifications:** Certified by EPA-approved certification program.
- B. **Regulatory Requirements:** Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. **Standards:** Comply with ANSI A10.6 and NFPA 241.
- D. **Predemolition Conference:** Conduct conference at Project site.

#### 1.7 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
  - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
  - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. **Hazardous Materials:** It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. On-site storage or sale of removed items or materials is not permitted.

#### 1.8 COORDINATION

- A. Arrange demolition schedule so as not to interfere with operations of adjacent occupied buildings.

### PART 2 - PRODUCTS

#### 2.1 SOIL MATERIALS

- A. **Satisfactory Soils:** Comply with requirements in Division 31 Section "Earth Moving."

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
- D. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.



- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

### 3.2 PREPARATION

- A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
  - 2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
  - 3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- C. Existing Utilities: Refer to Divisions 22 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
- D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of demolition.
- E. Salvaged Items: Comply with the following:
  - 1. Clean salvaged items of dirt and demolition debris.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to storage area designated by Owner.
  - 5. Protect items from damage during transport and storage.

### 3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
  - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
  - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated.
  - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
  - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 3. Erect a plainly visible fence around drip line of trees to remain.
  - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

### 3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
  - 2. Maintain fire watch during and for at least 2 hours after flame cutting operations.

3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.

C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

D. Explosives: Use of explosives is not permitted.

### 3.5 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

D. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

### 3.6 SITE RESTORATION

A. Below-Grade Areas: Completely fill below-grade areas and voids from building demolition operations with satisfactory soil materials according to backfill requirements in Division 31 Section "Earth Moving."

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

### 3.7 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

### 3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

### 3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 024116

## SECTION 033000 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls.
  - 3. Slabs-on-grade.
  - 4. Piers
  - 5. Equipment pads and bases.
- B. Related Sections include the following:
  - 1. Division Section 072100 "Thermal Insulation" for perimeter insulation under slabs-on-grade
  - 2. Division Section 31200 "Earth Moving" for drainage fill under slabs-on-grade.

#### 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Welding certificates.
- E. Qualification Data: For Installer and testing agency.
- F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- G. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Form materials and form-release agents.
  - 4. Steel reinforcement and accessories.
  - 5. Fiber reinforcement.
  - 6. Curing compounds.
  - 7. Floor and slab treatments.
  - 8. Bonding agents.

9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

H. Field quality-control test and inspection reports.

## 1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. **Testing Agency Qualifications:** An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
  2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- C. **Source Limitations:** Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- D. **Welding:** Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code—Reinforcing Steel."
- E. **ACI Publications:** Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
  2. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
  3. ACI 318, "Building Code Requirements for Structural Concrete."
- F. **Concrete:** Comply with Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- G. **Concrete Testing Service:** Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
1. Owner will employ and pay for a testing laboratory experienced in design and testing of concrete materials and mixes to perform quality control testing where required by Project Manager in accordance with General Conditions.
  2. Provide the services of a testing laboratory to design concrete mixes.
  3. Testing agency shall meet the requirements of ASTM E329.
  4. Selection of a testing laboratory is subject to the Project Manager's acceptance.
  5. Submit a written description of the proposed concrete testing laboratory giving qualifications of personnel, laboratory facilities and equipment, and other information as may be requested by the Project Manager.
- H. **Tests for Concrete Materials:**
1. For normal weight concrete, test aggregates by the methods of sampling and testing of ASTM C33.
  2. For Portland Cement, sample the cement and determine the properties by the methods of test of ASTM C150.
  3. Submit written reports for each material sampled and tested, prior to the start of Work. Provide the Project identification name and number, date of report, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results. Indicate whether or not materials are acceptable for intended use.
  4. Certificates of material properties and compliances with specified requirements may be submitted in lieu of testing, when acceptable to the project Manager. Certificates of Compliance must be signed by the materials producer and the Contractor.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  - 1. Plywood, metal, or other approved panel materials.
  - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. High-density overlay, Class 1 or better.
    - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    - c. Structural 1, B-B or better; mill oiled and edge sealed.
    - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. Form-Release Agent: Commercially formulated form-release agent with a maximum of 250 g/L volatile organic compounds (VOC's) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

### 2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60, deformed bars, assembled with clips.
- C. Plain-Steel Wire: ASTM A 82, as drawn.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

## 2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I, gray. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Lightweight Aggregate: ASTM C 330, 1/2-inch nominal maximum aggregate size.
- E. Water: ASTM C 94 and potable.

## 2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494, Type A.
  - 2. Retarding Admixture: ASTM C 494, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494, Type C.
  - 1. Products:
    - a. Euclid Chemical Company; Eucon CIA.
    - b. Grace Construction Products, W. R. Grace & Co.; DCI.
    - c. Master Builders, Inc.; Rheocrete CNI.
    - d. Sika Corporation; Sika CNI.
- D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
  - 1. Products:
    - a. Cortec Corporation; MCI 2005NS.
    - b. Grace Construction Products, W. R. Grace & Co.; DCI-S.
    - c. Master Builders, Inc.; Rheocrete 222+.
    - d. Sika Corporation; FerroGard-901.

## 2.7 FIBER REINFORCEMENT

- A. Carbon-Steel Fiber: ASTM A 820, deformed, minimum of 1.5 inches long, and aspect ratio of 45 to 50.
  - 1. Products:
    - a. Bekaert Corporation; Dramix.
    - b. Fibercon International, Inc.; Fibercon.
    - c. SI Concrete Systems; Zorex.
  - 2. Fiber: Type 2, cut sheet.
- B. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 3/4 inches long.
  - 1. Products:
    - a. Fibrillated Fibers:
      - 1) Euclid Chemical Company; Fiberstrand F.
      - 2) Grace Construction Products, W. R. Grace & Co.; Grace Fibers.
      - 3) SI Concrete Systems; Fibermesh.

## 2.8 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
  - 1. Products:
    - a. Fortifiber Corporation; Moistop Plus.
    - b. Raven Industries Inc.; Dura Skrim 8.
    - c. Reef Industries, Inc.; Griffolyn Type 85.
    - d. Stego Industries, LLC; Stego Wrap, 10 mils.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

## 2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  - 1. Products:
    - a. ChemMasters; Spray-Film.
    - b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
    - c. Dayton Superior Corporation; Sure Film.
    - d. Euclid Chemical Company; Euco-bar.
    - e. L&M Construction Chemicals, Inc.; E-Con.
    - f. Meadows, W. R., Inc.; Sealtight Evapre.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
  - 1. Products:
    - a. ChemMasters; Safe-Cure Clear.
    - b. Conspec Marketing & Manufacturing Co., a Dayton Superior Company; W.B. Resin Cure.
    - c. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
    - d. Euclid Chemical Company; Kurez DR VOX.
    - e. L&M Construction Chemicals, Inc.; L&M Cure R.
    - f. Meadows, W. R., Inc.; 1100 Clear.
    - g. Tamms Industries, Inc.; Homcure WB 30.

## 2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336-inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

## 2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash: 25 percent.
  - 2. Combined Fly Ash and Pozzolan: 25 percent.
  - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
  - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
  - 5. Silica Fume: 10 percent.
  - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
  - 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
  - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

## 2.12 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.



1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

## 2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.45.
  3. Slump Limit: 4 inches, plus or minus 1 inch.
  4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2 inch nominal maximum aggregate size.
  5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
- B. Foundation Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.45.
  3. Slump Limit: 4 inches, plus or minus 1 inch.
  4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
  5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3500 psi at 28 days.
  2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
  3. Slump Limit: 4 inches, plus or minus 1 inch.
  4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
  5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
  6. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
  7. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd.
  8. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

## 2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
  3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

## PART 3 - EXECUTION

### 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
  - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
  - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
  - 3. Install dovetail anchor slots in concrete structures as indicated.

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
  - C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.
- 3.4 VAPOR RETARDERS
- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
    - 1. Lap joints 12 inches and seal with manufacturer's recommended tape.
- 3.5 STEEL REINFORCEMENT
- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
    - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
  - B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
  - C. Accurately position, support and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
    - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
  - D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
  - E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- 3.6 JOINTS
- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
  - B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
    - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
    - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
    - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
    - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
    - 5. Space vertical joints in walls as indicated, or a maximum of 20 feet. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
    - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
    - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
    - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
    - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, and other locations, as indicated.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
  - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
  - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Comply with ACI304, "Guide For Measuring, Mixing, Transporting and Placing Concrete," and as specified.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Scream slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed-water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- H. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  1. Apply to concrete surfaces exposed to public view, to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
  1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  1. Apply a trowel finish to surfaces indicated, exposed to view or to be covered with ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  2. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4 inch
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed. While concrete is still plastic, slightly scarify surface with a fine broom.
  1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
  1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with comers, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

### 3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
  - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.