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May 8, 2015

New York City Office of Environmental Remediation
City Voluntary Cleanup Program
c/o Shaminder Chawla
100 Gold Street, 2nd Floor
New York, NY 10038

Re: VCP # 15CVCP095K
E-Designation # 12EHAZ200K
387 Manhattan Avenue
Remedial Action Work Plan (RAWP) Stipulation List

Dear Mr. Chawla:

Hydro Tech Environmental, Corp. (Hydro Tech) hereby submits a Remedial Action Plan (RAWP) Stipulation List for the Site to the New York City Office of Environmental Remediation (OER) on behalf of Manhattan Avenue Development, LLC. This letter serves as an addendum to the RAWP to stipulate additional content, requirements, and procedures that will be followed during the site remediation. The contents of this list are added to the RAWP and will supersede the content in the RAWP where there is a conflict in purpose or intent. The additional requirements/procedures include the following Stipulation List below:

1. The criterion attached in **Appendix 1** will be utilized if additional petroleum containing tank or vessel is identified during the remedial action or subsequent redevelopment excavation activities. All petroleum spills will be reported to the NYSDEC hotline as required by applicable laws and regulations. This contingency plan is designed for heating oil tanks and other small or moderately sized storage vessels. If larger tanks, such as gasoline storage tanks are identified, OER will be notified before this criterion is utilized.

2. A pre-construction meeting is required prior to start of remedial excavation work at the site. A pre-construction meeting will be held at the site and will be attended by OER, the developer or developer representative, the consultant, excavation/general contractor, and if applicable, the soil broker.

3. A pre-approval letter from all disposal facilities will be provided to OER prior to any soil/fill material removal from the site. Documentation specified in the RAWP - Appendix 3 - Section 1.6 "Materials Disposal Off-Site" will be provided to OER. If a different disposal facility for the soil/fill material is selected, OER will be notified immediately.

4. Signage for the project will include a sturdy placard mounted in a publically accessible right of way to building and other permits signage will consist of the NYC VCP Information Sheet (attached **Appendix 2**) announcing the remedial action. The Information sheet will be laminated and permanently affixed to the placard.

5. If the remedy for the site includes the excavation and disposal of hazardous waste, the OER can work with the development team to exempt your property from the $130/ton state Hazardous Waste Program Fee and the Special Assessment on Hazardous Waste which charges a tax of up to $27 per ton. It is the applicant's responsibility to notify the OER Project Manager, copying Deputy Director Shaminder Chawla, before hazardous waste is shipped from your site. The OER will charge a fee of $10 per ton for facilitating delivery of an exemption from the Department of Environmental Conservation. **Appendix 3** includes additional information about the Exemption for Hazardous Waste Program Fee.

6. Collection and analysis of 3 end-point samples from the bottom of the excavation will be collected to evaluate the performance of the remedy with respect to attainment of Track 4 SCOs. Collection and analysis of 5 end-point samples from the designated hot spot located in the western portion of the Site to evaluate the performance of the remedy with respect to attainment of Track 4 SCOs. A map indicating end-point sampling locations is attached in **Appendix 4**. Samples will be analyzed for contaminants of concern SVOCs and Metals.

7. The OER requires parties seeking City Brownfield Incentive Grants to carry insurance. For a cleanup grant, both the excavator and the trucking firm(s) that handle removal of soil must carry or be covered under a commercial general liability (CGL) policy that provides $1 million per claim in coverage. OER recommends that excavators and truckers also carry contractor's pollution liability (CPL) coverage, also providing $1 million per claim in coverage. The CGL policy, and the CPL policy if obtained, must name the City of New York, the NYC Economic Development Corporation, and Brownfield Redevelopment Solutions as additional insured. For an investigation grant, an environmental consultant must be a qualified vendor in the BIG program and carry $1 million of professional liability (PL) coverage. A fact sheet regarding insurance is attached as **Appendix 5**.

8. Daily reports will be provided during active excavation work. If no work is performed for extended time period, daily report frequency will be reduced to weekly basis. Daily report template is attached in **Appendix 6.**

9. A 46-mil vapor barrier will be installed beneath the structure's slab and along foundation sidewalls. The barrier chosen for this project is manufactured by Grace Preprufe®, model number 300R & 160R. **Appendix 7** provides manufactures specifications and PE/RA certified building plans with the extent of the vapor barrier installation details (penetrations, joints, etc.) with respect to the proposed foundation, footings, etc.

10. An engineered composite site cover will be placed over the entire footprint of the Site. The composite cover system will be comprised of concrete foundation/slabs. Drawings of the composite site cover are provided as **Appendix 8**.

11. Truck route is included in **Appendix 9.**

12. Dewatering will be performed in full compliance with applicable laws, rules and regulations. Dewatering permit will be obtained from NYCDEP prior to construction activities.

13. Updated project description is here (Add description if different from that is proposed in RAWP): The new development will consist of a 6-story building that will be utilized for commercial and residential use. The first story will be utilized for retail space, a shared lobby and mechanical rooms with approximately 525 square feet of retail space, 560 square feet of community facility and 2,403 square feet of residential space with a parking lot in the western portion of the site. The second and third floors consist of community facility medical suites and approximately 6,896 square feet. The fourth through sixth floor consist of 12 rental apartments and approximately 8,393 square feet.

Sincerely,
Hydro Tech Environmental, Corp.

Holly Hawkins
Project Geologist

HH/ph
Enc.

cc: Rudy Abramov
A. Alfieri, NYCOER

Appendix 1
Generic Procedures for Management of Underground Storage Tanks
Identified under the NYC VCP

Prior to Tank removal, the following procedures should be followed:

- Remove all fluid to its lowest draw-off point.
- Drain and flush piping into the tank.
- Vacuum out the "tank bottom" consisting of water product and sludge.
- Dig down to the top of the tank and expose the upper half.
- Remove the fill tube and disconnect the fill, gauge, product, vent lines and pumps. Cap and plug open ends of lines.
- Temporarily plug all tank openings, complete the excavation, remove the tank and place it in a secure location.
- Render the tank safe and check the tank atmosphere to ensure that petroleum vapors have been satisfactorily purged from the tank.
- Clean tank or remove to storage yard for cleaning.
- If the tank is to be moved, it must be transported by licensed waste transporter. Plug and cap all holes prior to transport leaving a 1/8 inch vent hole located at the top of the tank during transport.
- After cleaning, the tank must be made acceptable for disposal at a scrap yard, cleaning the tanks interior with a high pressure rinse and cutting the tank in several pieces.

During the tank and pipe line removal, the following field observations should be made and recorded:

- A description and photographic documentation of the tank and pipe line condition (pitting, holes, staining, leak points, evidence of repairs, etc.).
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.).
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation, with a calibrated photoionization detector (PID).

<u>Impacted Soil Excavation Methods</u>
The excavation of the impacted soil will be performed following the removal of the existing tanks. Soil excavation will be performed in accordance with the procedures described under Section 5.5 of Draft DER-10 as follows:

- A description and photographic documentation of the excavation.
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.).
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation, with calibrated photoionization detector (PID).

Final excavation depth, length, and width will be determined in the field, and will depend on the horizontal and vertical extent of contaminated soils as indentified through physical examination (PID response, odor, staining, etc.). Collection of verification samples will be performed to evaluate the success of the removal action as specified in this document.
The following procedure will be used for the excavation of impacted soil (as necessary and appropriate):

- Wear appropriate health and safety equipment as outlined in the Health and Safety Plan.

- Prior to excavation, ensure that the area is clear of utility lines or other obstructions. Lay plastic sheeting on the ground next to the area to be excavated.
- Using a rubber-tired backhoe or track mounted excavator, remove overburden soils and stockpile, or dispose of, separate from the impacted soil.
- If additional UST's are discovered, the NYSDEC will be notified and the best course of action to remove the structure should be determined in the field. This may involve the continued trenching around the perimeter to minimize its disturbance.
- If physically contaminated soil is present (e.g., staining, odors, sheen, PID response, etc.) an attempt will be made to remove it, to the extent not limited by the site boundaries or the bedrock surface. If possible, physically impacted soil will be removed using the backhoe or excavator, segregated from clean soils and overburden, and staged on separated dedicated plastic sheeting or live loaded into trucks from the disposal facility. Removal of the impacted soils will continue until visibly clean material is encountered and monitoring instruments indicate that no contaminants are present.
- Excavated soils which are temporarily stockpiled on-site will be covered with tarp material while disposal options are determined. Tarp will be checked on a daily basis and replaced, repaired or adjusted as needed to provide full coverage. The sheeting will be shaped and secured in such a manner as to drain runoff and direct it toward the interior of the property.

Once the site representative and regulatory personnel are satisfied with the removal effort, verification of confirmatory samples will be collected from the excavation in accordance with DER-10.

Appendix 2
NYC VCP Signage

NYC Voluntary Cleanup Program

387 Manhattan Avenue
Site #: 15CVCP095K

This property is enrolled in the New York City Voluntary Cleanup Program for environmental remediation. This is a voluntary program administered by the NYC Office of Environmental Remediation.

For more information,
log on to: www.nyc.gov/oer

Or scan with smart phone:

If you have questions or would like more information, please contact:

Shaminder Chawla at (212) 442-3007
or email us at brownfields@cityhall.nyc.gov

Appendix 3
Hazardous Waste Fee Exemption Fact Sheet

PlaNYC
NYC Office of Environmental Remediation

Exemption from the Hazardous Waste Program Fee

If your site is enrolled in the city Voluntary Cleanup Program and contains hazardous waste that will be excavated and disposed of offsite, OER can work with your development team to exempt your property from the $130/ton state Hazardous Waste Program fee. This exemption does not cover, and you remain liable for, the Special Assessment on Hazardous Waste (established by ECL§ 27-0923).

To qualify for an exemption from the Hazardous Waste Program Fee:

1. A site must be enrolled in the city Voluntary Cleanup Program;
2. Hazardous waste must result from remedial action set forth in a cleanup plan approved by OER; and
3. OER must oversee the cleanup.

Process for obtaining a Hazardous Waste Program Fee exemption:

For each VCP site, OER will submit three certifications to the New York State Department of Environmental Conservation (DEC):

1. OER will prepare a Notice of Potential Generation after a soil test shows a site contains hazardous waste. To prepare this Notice, you must provide your OER project manager with:

   - the site's EPA generator ID number;
   - the date of the soil test confirming hazardous waste;
   - the amount of hazardous waste in tons that you anticipate shipping offsite; and
   - the anticipated dates for the start and completion of remediation.

DEC must receive this form **before** hazardous waste is shipped from your site. Otherwise your claim for an exemption may be denied.

2. After hazardous waste has been removed from the site, OER will distribute a Certification of Hazardous Waste Generation to your project team which when filled out documents how the hazardous waste was managed. Once completed, it must be signed by the generator (or site owner) and the site's Qualified Environmental Professional and returned to your OER project manager with a copy to Shana Holberston sholbertson@dep.nyc.gov and Mark McIntyre mmcintyre@cityhall.nyc.gov.

3. OER will then issue a Certification of Remedial Action that Generated Hazardous Waste to DEC representing OER's approval of how a site managed its hazardous waste.

Upon OER's submission of the last two certifications to DEC, the agency will issue a written statement exempting an individual site from the Hazardous Waste Program Fee. OER will then notify the project of the exemption.

For further information, please contact:

Shana Holberton
Program Manager
(212) 788-3220
SHolberton@dep.nyc.gov

or

Mark McIntyre
General Counsel
(212) 788-3015
MMcintyre@cityhall.nyc.gov

Exemption from the Hazardous Waste Program Fee

Office of Environmental Remediation

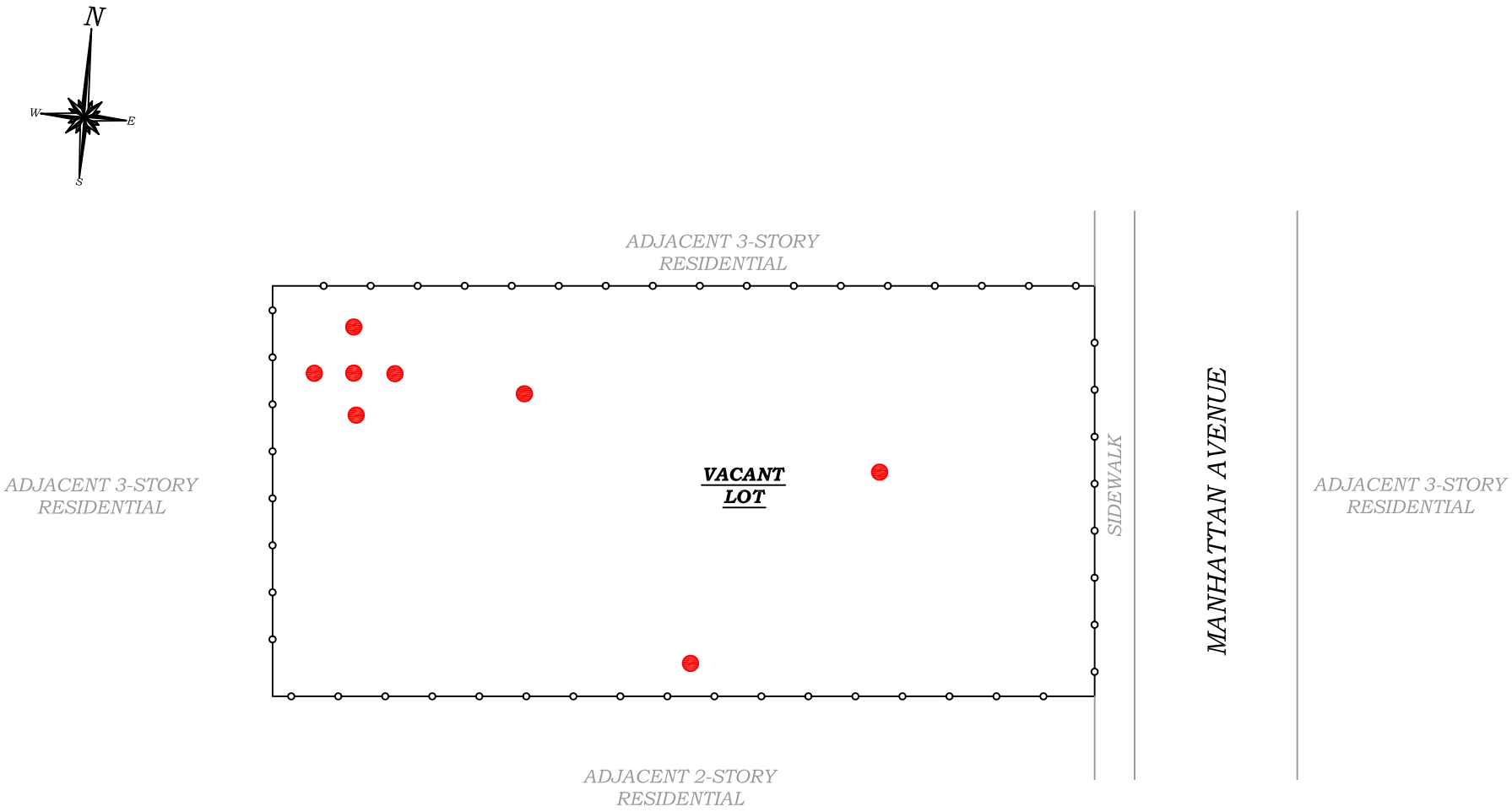
Ongoing Obligations:

Regardless of the Hazardous Waste Program Fee exemption, parties must:

- File a Hazardous Waste Annual Report with DEC by March 1 of each year if your site generated 15 tons of hazardous waste or more in the relevant calendar year. For details, see http://www.dec.ny.gov/chemical/8770.html To set forth the basis for an exemption from the Hazardous Waste Program Fee, put an X in the Exempt Remedial box in Box H of Section 1 of the Waste Generation and Management (GM) form and in the Comments Box (at the bottom of the form) include "New York City Voluntary Cleanup Program, VCP Site Number_____)"; and

- Make quarterly payments of the Special Assessment on Hazardous Waste to the state Department of Taxation and Finance. For details see: http://www.tax.ny.gov/bus/haz/hzrdwste.htm

Appendix 4
End-Point Sampling Map



LEGEND:

● *END POINT SAMPLING LOCATIONS*

0' 10' 20'

SCALE IN FEET (FT.)

HYDRO TECH ENVIRONMENTAL CORP.

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NYC OFFICE:
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BROOKLYN, NEW YORK 11225
T (718)636-0800 F (718)636-0900

www.hydrotechenvironmental.com

387 Manhattan Avenue
Brooklyn, NY.
HTE Job # 150075

Drawn By: C.Q.
Reviewed By: M.R
Approved By: M.R
Date: 04/24/15
Scale: AS NOTED

TITLE:

END POINT SAMPLING PLAN

Appendix 5
BIG Program Insurance Fact Sheet

FACT SHEET – BIG PROGRAM INSURANCE REQUIREMENTS

Investigation Grants – for a developer or site owner to be eligible for a BIG investigation grant, its environmental consultant(s) must be:

- a Qualified Vendor in the BIG Program; and
- maintain Professional Liability (PL) insurance of $1M per claim and annual aggregate.

Cleanup Grants – for a developer or site owner to be eligible for a BIG cleanup grant:

- Its general contractor or excavation/foundation contractor hired to perform remedial work must maintain Commercial General Liability (CGL) insurance of at least $1M per occurrence and $2M in the general aggregate. It is recommended that the general contractor or excavation/foundation contractor also maintain a Contractors Pollution Liability policy (CPL) of at least $1M per occurrence.

- Its subcontractors who are hired by the general contractor etc. to perform remedial work at a site, including soil brokers and truckers, must also maintain a CGL policy in the amount and with the terms set forth above. It is recommended that subcontractors also maintain a CPL policy in the amount and with the terms set forth above.

  The CGL policy, and the CPL policy if in force, must list the city, EDC and BRS as additional insureds, include completed operations coverage and be primary and non-contributory to any other insurance the additional insureds may have.

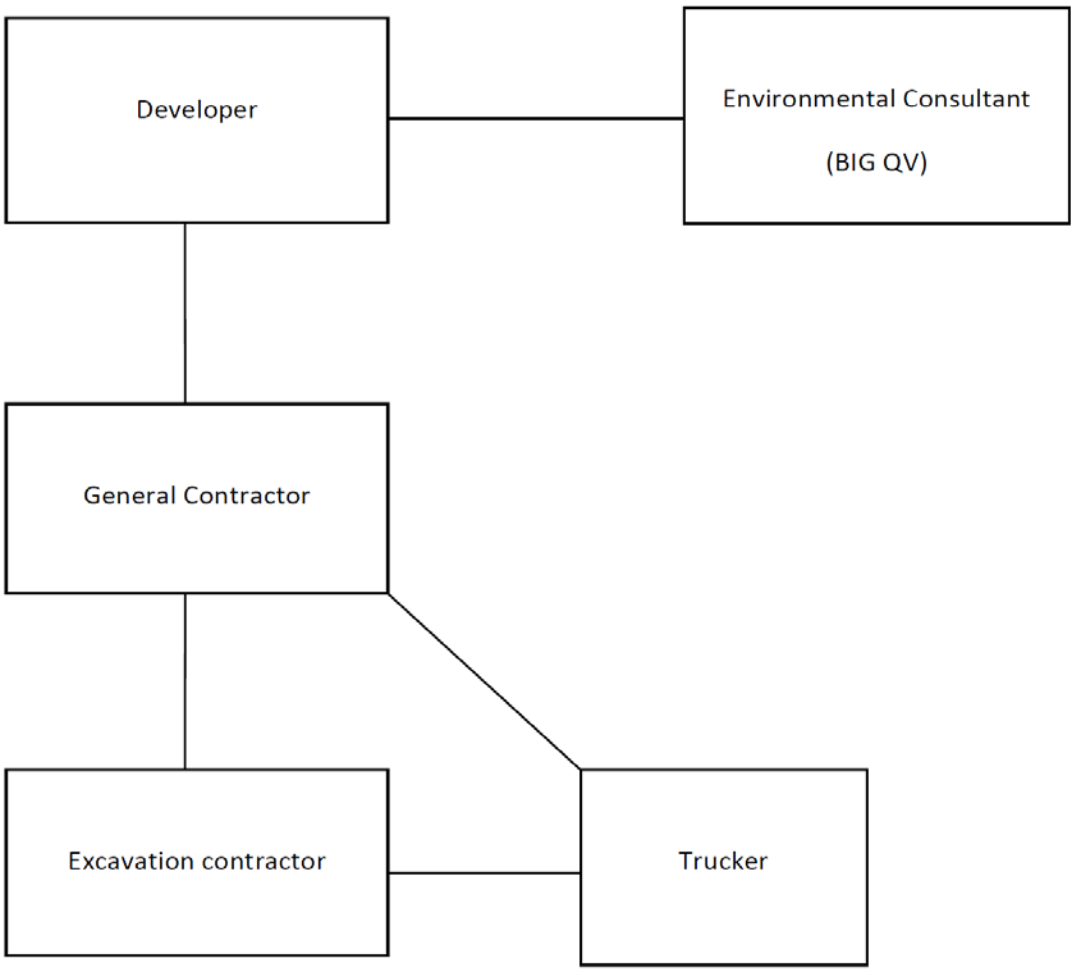
- Its environmental consultant(s) hired to oversee the cleanup must be:
  a. a BIG Qualifed Vendor; and
  b. maintain Professional Liability (PL) insurance of $1M per claim and annual aggregate.

If, in the alternative, the developer hires its environmental consultant to perform the cleanup, the environmental consultant must maintain CGL insurance in the amount and with the terms set forth above. It is recommended that the environmental consultant also maintain CPL coverage in the amount and with the terms set forth in the first two bulleted items listed above.

A schematic presenting the contractual relationships described above appears on page 2. Parties who must be named as Additional Insureds on Cleanup Grant insurance policies (CGL and CPL) are presented on page 3.

Example of Contractual Relationships for Cleanup Work

The Office of Environmental Remediation's Voluntary Cleanup Plan program requires applicants to identify the parties who are engaged in active remediation of their sites including: the General Contractor hired to remediate and/or the excavation contractor hired to excavate soil from the site and the trucking firm(s) that remove soil from the site for disposal at approved facilit(ies).



The chart above shows contractual relationships that typically exist for projects that are enrolled in the Voluntary Cleanup Program.

BIG Program Additional Insureds

The full names and addresses of the additional insureds required under the Required CGL Policy and recommended CPL Policy are as follows:

"City and its officials and employees"
New York City Mayor's Office of Environmental Remediation
253 Broadway, 14th Floor
New York, NY 10007

"NYC EDC and its officials and employees"
New York City Economic Development Corporation
110 William Street
New York, NY 10038

"BIG Grant Administrator and its officials and employees"
Brownfield Redevelopment Solutions, Inc.
739 Stokes Road, Units A & B
Medford, NJ 08055

Appendix 6
Daily Report Template

Office of Environmental Remediation

Daily Status Report Template
Version 1.3

Generic Template for Daily Status Report

Instructions

The Daily Status Report submitted to OER should adhere to the following conventions:

- Remove this cover sheet prior to editing.
- Remove all the red text and replace with site-specific information.
- Submit the final version as a Word or PDF file.

Daily Status Reports

Daily status reports providing a general summary of activities for each day of *active remedial work* will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any;
- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

DAILY STATUS REPORT

Prepared By: Enter Your Name Here

WEATHER	Snow		Rain		Overcast		Partly Cloudy	X	Bright Sun	
TEMP.	< 32		32-50		50-70	X	70-85		>85	

VCP Project No.:	14CVCP000M	E-Number Project No.:	14EHAN000M	Date:	01/01/2014
Project Name:	Name or Address				

Consultant: Person(s) Name and Company Name	Safety Officer: Person(s) Name and Company Name
General Contractor: Person(s) Name and Company Name	Site Manager/ Supervisor: Person(s) Name and Company Name
Work Activities Performed (Since Last Report): Provide details about the work activities performed.	
Working In Grid #: A1, B1, C1	

Samples Collected (Since Last Report): No samples collected or provide details
Air Monitoring (Since Last Report): No air monitoring performed or provide details Prestart Conditions – PID = 0.0 ppm, Dust = 0.000 High Conditions – PID = 0.0 ppm, Dust = 0.000
Problems Encountered: No problems encountered or provide details
Planned Activities for the Next Day/ Week: Provide details about the work activities planned for the next day/ week.

									Example:	
Facility # Name/ Location Type of Waste Solid Or Liquid	Facility # Name Location Type of Waste Solid *Or* Liquid		Facility # Name Location Type of Waste Solid *Or* Liquid		Facility # Name Location Type of Waste Solid *Or* Liquid		Facility # Name Location Type of Waste Solid *Or* Liquid		# # # # # # # Clean Earth Carteret, NJ petroleum soils Solid	
(Trucks, Cu.Yds. Or Gallons)	Trucks	Cu. Yds. *Or* Gallons	Trucks	Cu. Yds. *Or* Gallons	Trucks	Cu. Yds. *Or* Gallons	Trucks	Cu. Yds. *Or* Gallons	Trucks	Cu. Yds.
Today									5	120
Total									25	600

NYC Clean Soil Bank		Receiving Facility: Name/ Address (Approved by OER)			
Tracking No.:	13CCSB000				
Today	Trucks 5	Cu. Yds. 25	Total	Trucks 120	Cu. Yds. 600

Site Grid Map

Insert the site grid map here

Photo Log

Photo 1 – provide a caption	Insert Photo Here – Photo of the entire site
Photo 2 – provide a caption	Insert Photo Here – Photo of the work activities performed
Photo 3 – provide a caption	Insert Photo Here – Photo of the work activities performed

Appendix 7
Vapor Barrier Specifications

GRACE

PREPRUFE® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites

Description

Preprufe® 300R & 160R membranes are unique composite sheets comprising a thick HDPE film, an aggressive pressure sensitive adhesive and a weather resistant protective coating.

Unlike conventional non-adhering membranes, which are vulnerable to water ingress tracking between the unbonded membrane and structure, the unique Preprufe bond to concrete prevents ingress or migration of water around the structure.

The Preprufe R System includes:

- **Preprufe 300R**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R**—thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe Tape LT**—for covering cut edges, roll ends, penetrations and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C)).
- **Preprufe Tape HC**—as above for use in Hot Climates (minimum 50°F (10°C)).
- **Bituthene® Liquid Membrane**—for sealing around penetrations, etc.

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted sand or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor® fluid applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.

Advantages

- **Forms a unique continuous adhesive bond to concrete poured against it**—prevents water migration and makes it unaffected by ground settlement beneath slabs
- **Fully-adhered watertight laps** and detailing
- **Provides a barrier to water, moisture and gas**—physically isolates the structure from the surrounding ground
- **BBA Certified** for basement Grades 2, 3, & 4 to BS 8102:1990
- **Zero permeance** to moisture
- **Solar reflective**—reduced temperature gain
- **Simple and quick to install**—requiring no priming or fillets
- **Can be applied to permanent formwork**—allows maximum use of confined sites
- **Self protecting**—can be trafficked immediately after application and ready for immediate placing of reinforcement
- **Unaffected by wet conditions**—cannot activate prematurely
- Inherently waterproof, non-reactive system:
  - not reliant on confining pressures or hydration
  - unaffected by freeze/thaw, wet/dry cycling
- **Chemical resistant**—effective in most types of soils and waters, protects structure from salt or sulphate attack

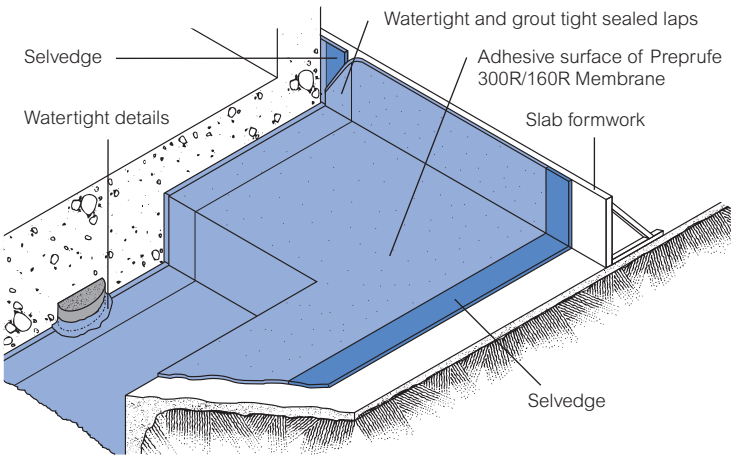
Installation

The most current application instructions, detail drawings and technical letters can be viewed at www.graceconstruction.com. Technical letters are provided for the following subjects to assist in the installation of Preprufe:

- Chemical Resistance
- Minimizing Concrete Shrinkage and Curling
- Rebar Chairs on Preprufe 300R Membrane
- Removal of Formwork Placed Against Preprufe Membranes
- Winter Lap Sealing and the use of Preprufe Tape LT

For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 4 ft (1.2 m) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.



Drawings are for illustration purposes only.
Please refer to www.graceconstruction.com for specific application details.

BBA BRITISH BOARD OF AGREMENT CERTIFICATE No. 97/3325

Substrate Preparation

All surfaces—It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 0.5 in. (12 mm). Grout around all penetrations such as utility conduits, etc. for stability (see Figure 1).

Horizontal—The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. The surface does not need to be dry, but standing water must be removed.

Vertical—Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 0.5 in. (12 mm) out of alignment.

Membrane Installation

Preprufe can be applied at temperatures of 25°F (-4°C) or above. When installing Preprufe in cold or marginal weather conditions 55°F (<13°C) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application.

Horizontal substrates—Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed (see Figure 2).

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

Refer to Grace Tech Letters for information on suitable rebar chairs for Preprufe.

Vertical substrates—Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the the clear plastic release liner facing towards the concrete pour. The membrane may be installed in any convenient length. Secure the top of the membrane using a batten such as a termination bar or similar 2 in. (50 mm) below the top edge (see Figure 3). Fastening can be made through the selvedge so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner. Any additional fasteners must be covered with a patch of Preprufe Tape (see Figure 4).

Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges—Overlap all roll ends and cut edges by a minimum 3 in. (75 mm) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap and roll firmly. Immediately remove printed plastic release liner from the tape.

Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit www.graceconstruction.com. This Manual gives comprehensive guidance and standard details for:

- internal and external corners
- penetrations
- tiebacks
- columns
- grade beam pilecaps
- tie-ins
- terminations

Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by jet washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (0.5 in. (12 mm) or less) and slices by applying Preprufe Tape centered over the damaged area and roll firmly. Remove the release liner from the tape. Repair holes and large punctures by applying a patch of Preprufe membrane, which extends 6 in. (150 mm) beyond the damaged area. Seal all edges of the patch with Preprufe Tape, remove the release liner from the tape and roll firmly. Any areas of damaged adhesive should be covered with Preprufe Tape. Remove printed plastic release liner from tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape, rolling firmly. Alternatively, use a hot air gun or similar to activate adhesive and firmly roll lap to achieve continuity.

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe R Membrane and Tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Concrete must be placed and compacted carefully to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

Removal of Formwork

Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems.

A minimum concrete compressive strength of 1500 psi (10 N/mm^2) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

As a guide, to reach the minimum compressive strength stated above, a structural concrete mix with an ultimate strength of 6000 psi (40 N/mm^2) will typically require a cure time of approximately 6 days at an average ambient temperature of 25°F (-4°C), or 2 days at 70°F (21°C).

Figure 1

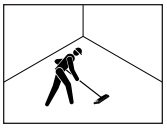


Figure 2

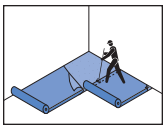
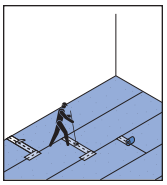
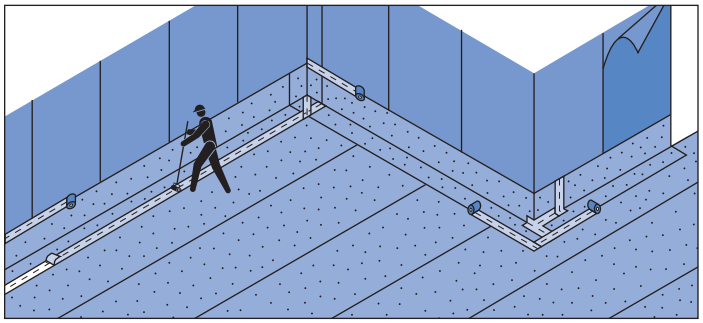


Figure 3

Figure 4

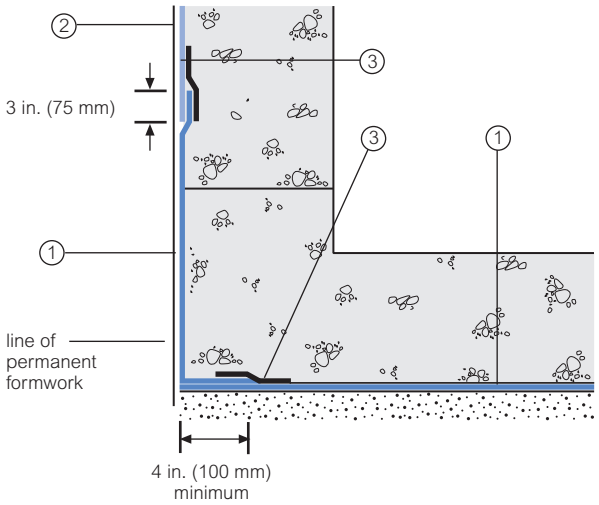




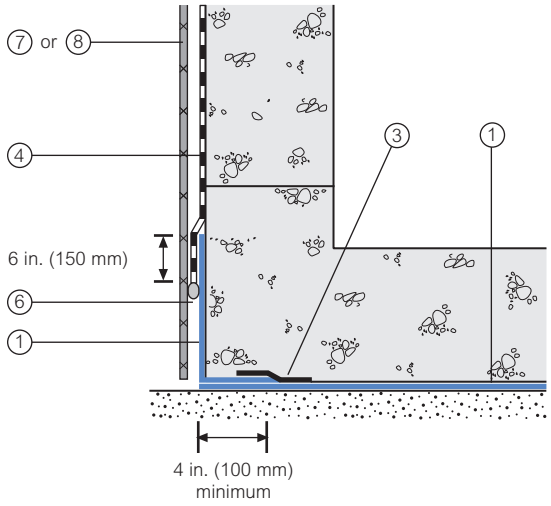
Detail Drawings

Details shown are typical illustrations and not working details. For a list of the most current details, visit us at www.graceconstruction.com. For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

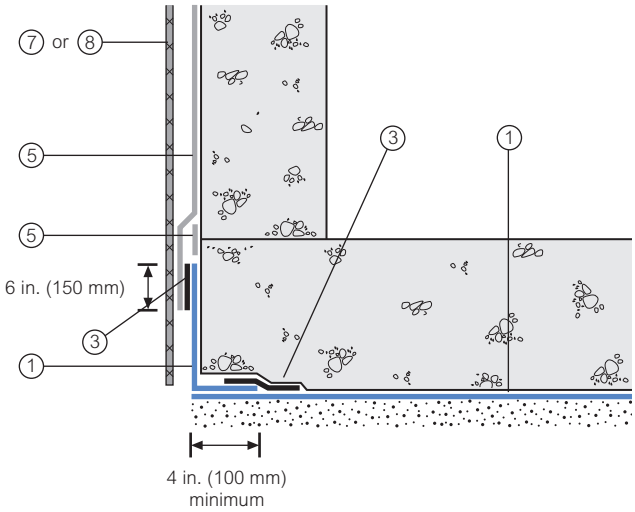
Wall base detail against permanent shutter



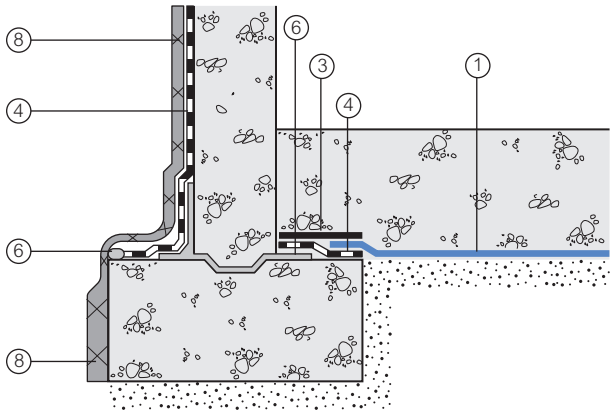
Bituthene wall base detail (Option 1)



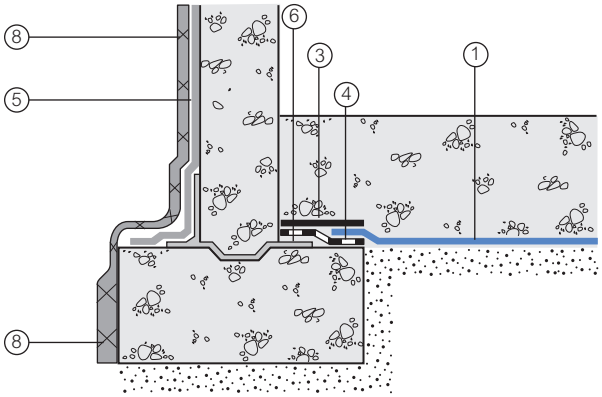
Procor wall base detail (Option 1)



Bituthene wall base detail (Option 2)



Procor wall base detail (Option 2)



1 Preprufe 300R
2 Preprufe 160R
3 Preprufe Tape
4 Bituthene
5 Procor
6 Bituthene Liquid Membrane
7 Protection
8 Hydroduct®

Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	4 ft x 98 ft (1.2 m x 30 m)	4 ft x 115 ft (1.2 m x 35 m)	4 in. x 49 ft (100 mm x 15 m)
Roll area	392 ft^2 (36 m^2)	460 ft^2 (42 m^2)	
Roll weight	108 lbs (50 kg)	92 lbs (42 kg)	4.3 lbs (2 kg)
Minimum side/end laps	3 in. (75 mm)	3 in. (75 mm)	3 in. (75 mm)
* LT denotes Low Temperature (between 25°F (-4°C) and 86°F (+30°C)) HC denotes Hot Climate (50°F (>+10°C))			
Ancillary Products			
Bituthene Liquid Membrane—1.5 US gal (5.7 liter) or 4 US gal (15.1 liter)			

Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm) nominal	0.032 in. (0.8 mm) nominal	ASTM D3767
Low temperature flexibility	Unaffected at -10°F (-23°C)	Unaffected at -10°F (-23°C)	ASTM D1970
Resistance to hydrostatic head, minimum	231 ft (70 m)	231 ft (70 m)	ASTM D5385, modified[1]
Elongation, minimum	300%	300%	ASTM D412, modified[2]
Tensile strength, film, minimum	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -10°F (-23°C), 100 cycles	Unaffected	Unaffected	ASTM C836
Puncture resistance, minimum	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete, minimum	5.0 lbs/in. (880 N/m) width	5.0 lbs/in. (880 N/m) width	ASTM D903, modified[3]
Lap peel adhesion	2.5 lbs/in. (440 N/m) width	2.5 lbs/in. (440 N/m) width	ASTM D1876, modified[4]
Permeance to water vapor transmission, maximum	0.01 perms (0.6 ng/(Pa × s × m^2))	0.01 perms (0.6 ng/(Pa × s × m^2))	ASTM E96, method B
Water absorption, maximum	0.5%	0.5%	ASTM D570
Methane permeability	9.1 mls/m^2/day	N/A	University of London, QMW College[3]
Permeability[5] (hydraulic conductivity)	K=<1.4 x 10^{-11}cm.s^{-1}	K=<1.4 x 10^{-11}cm.s^{-1}	ASTM D5084-90

Footnotes:

1. Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
2. Elongation of membrane is run at a rate of 2 in. (50 mm) per minute.
3. Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 2 in. (50 mm) per minute at room temperature.
4. The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 2 in. (50 mm) per minute at 25°F (-4°C).
5. Result is lower limit of apparatus. Membrane therefore considered impermeable.

Specification Clauses

Preprufe 300R or 160R shall be applied with its adhesive face presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to Preprufe 300R/160R. All Preprufe 300R/160R system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions.

Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor with Preprufe.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

www.graceconstruction.com

For technical assistance call toll free at 866-333-3SBM (3726)

PF-111E Printed in U.S.A. 3/07 FA/LI/1M

GRACE

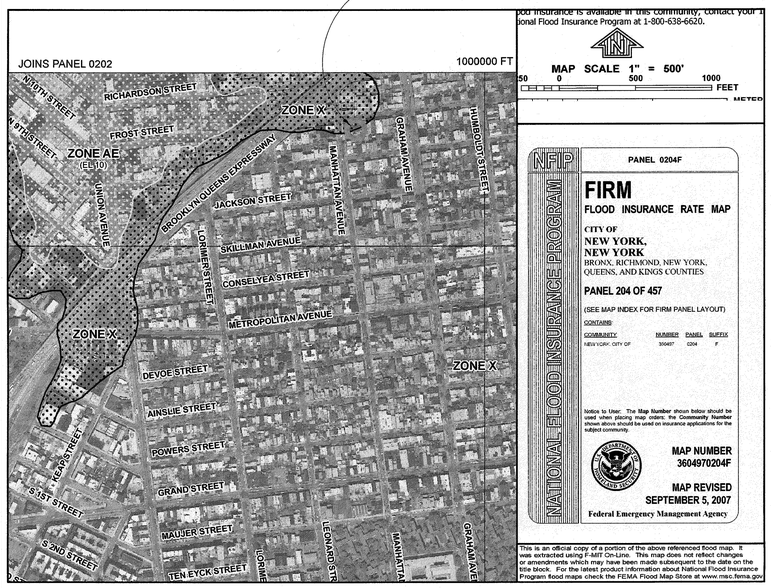
MIXED USED DEVELOPMENT

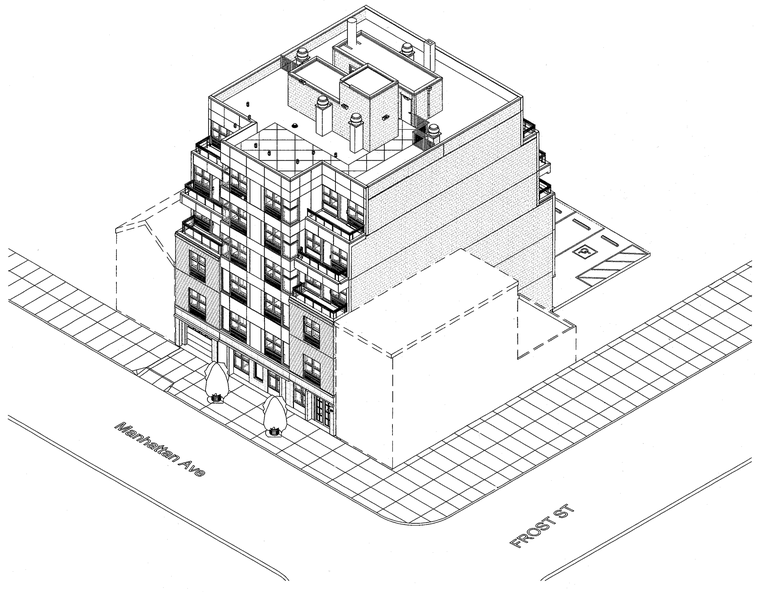
387 MANHATTAN AVE, BROOKLYN, NY 11211

ZONING DATA:

APPLICABLE CODE	: 2014 NEW YORK CITY BUILDING CODE
BLOCK NO.	: 2738
LOT NUMBERS	: 21
MAP	:13a
ZONING DISTRICT	: M1-2/R6
SPECIAL DISTRICT	: MX-8
COMMERCIAL OVERLAY	: NONE
LOT AREA	: 5,000 SF
GENERAL DESCRIPTION	: MIXED USE BUILDING
BUILDING USE GROUPS	: B
	: R2 (MULTIFAMILY RESIDENTIAL)
CONSTRUCTION CLASSIFICATION	: IIA
	: NYC BUILDING CODE, SECTION 602, TABLE 601
NUMBER OF STORIES	: 6
FIRE SPRINKLERS	: FULLY SPRINKLED

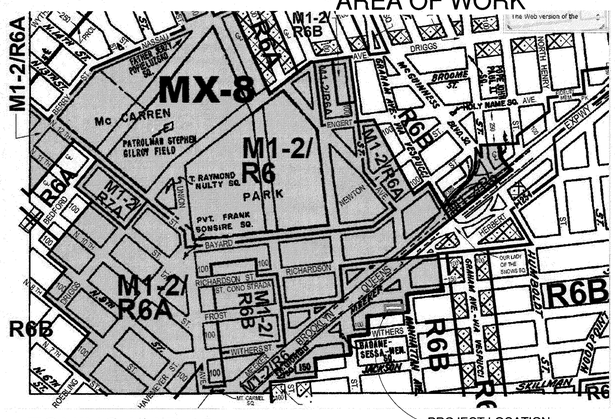
FLOOD ZONE X





AXONOMETRIC

AREA OF WORK



ZONING MAP 13a

SPECIAL INSPECTION ITEMS:

STRUCTURAL STEEL – WELDING	BC 1704.3.1
STRUCTURAL STEEL – DETAILS	BC 1704.3.2
STRUCTURAL STEEL – HIGH STRENGTH BOLTING	BC 1704.3.3
STRUCTURAL COLD-FORMED STEEL	BC 1704.3.4
CONCRETE – CAST-IN-PLACE	BC 1704.4
CONCRETE – PRECAST	BC 1704.4
MASONRY	BC 1704.5
SUBGRADE INSPECTION	BC 1704.7.1
SUBSURFACE CONDITIONS – FILL PLACEMENT & IN-PLACE DENSITY	BC 1704.7.2, BC 1704.7.3
SUBSURFACE INVESTIGATIONS (BORINGS/TEST PITS) ▉ TR4	BC 1704.7.4
DEEP FOUNDATION ELEMENTS ▉ TR5	BC 1704.8
WALL PANELS, CURTAIN WALLS, AND VENEERS	BC 1704.10
SPRAYED FIRE-RESISTANT MATERIALS	BC 1704.11
MECHANICAL SYSTEMS	BC 1704.16
EXCAVATIONS—SHEETING, SHORING, AND BRACING	BC 1704.20.2
UNDERPINNING	BC 1704.20.3, BC 1814
PRIVATE ON-SITE STORM WATER DRAINAGE DISPOSAL SYSTEMS, AND DETENTION FACILITIES INSTALLATION	BC 1704.21.2
SPRINKLER SYSTEMS	BC 1704.23
STANDPIPE SYSTEMS	BC 1704.24
HEATING SYSTEMS	BC 1704.25
CHIMNEYS	BC 1704.26
FIRE-RESISTANT PENETRATIONS AND JOINTS	BC 1704.27
POST-INSTALLED ANCHORS (BB# 2014-018, 2014-019)	BC 1704.32
CONCRETE DESIGN MIX ▉ TR3	BC 1905.3, BC 1913.5
CONCRETE SAMPLING AND TESTING ▉ TR2	BC 1905.6, BC 1913.10

PROGRESS INSPECTION:ITEMS:

FOOTING AND FOUNDATION BC 110.3.1	28-116.2.1, BC 110.2
ENERGY CODE COMPLIANCE INSPECTIONS ▉ TR8	BC 110.3.5
FIRE-RESISTANCE RATED CONSTRUCTION	BC 110.3.4
FINAL*	28-116.2.4.2, BC 110.5,
DIRECTIVE 14 OF 1975, AND 1 RCNY §101-10	

ENERGY CODE PROGRESS INSPECTIONS

PROTECTION OF EXPOSED FOUNDATION INSULATION	(IA1), (IIA1)
INSULATION PLACEMENT AND R VALUES	(IA2), (IIA2)
FENESTRATION U-FACTOR AND PRODUCT RATING	(IA3), (IIA3)
FENESTRATION AIR LEAKAGE	(IA4), (IIA4)
FENESTRATION AREAS	(IA5), (IIA5)
AIR SEALING AND INSULATION — VISUAL	(IA6), (IIA6)
VESTIBULES	(IIA9)
FIREPLACES	(IB1), (IIB1)
SHUTOFF DAMPERS	(IB2), (IIB2)
HVAC AND SERVICE WATER HEATING EQUIPMENT	(IB3), (IIB3)
HVAC AND SERVICE WATER HEATING SYSTEM CONTROLS	(IB4), (IIB4)
HVAC INSULATION AND SEALING	(IB5), (IIB5)
DUCT LEAKAGE TESTING	(IB6), (IIB6)
ELECTRICAL ENERGY CONSUMPTION	(IC1), (IIC1)
LIGHTING IN DWELLING UNITS	(IIC2)
INTERIOR LIGHTING POWER	(IC2), (IIC3)
EXTERIOR LIGHTING POWER	(IIC4)
LIGHTING CONTROLS	(IIC5)
EXIT SIGNS	(IIC6)
ELECTRICAL MOTORS	(IIC7)
MAINTENANCE INFORMATION	(ID1), (IID1)

TITLE

CIVIL

STRUCTURAL

ARCHITECTURAL

ELECTRICAL

ENERGY COMPLIANCE:

HVAC

PLUMBING

RELATED APPLICATIONS (FILED SEPARATELY)

- CURB CUT APPLICATION
- BUILDERS PAVEMENT PLAN (BPP)
- CONSTRUCTION FENCE
- SIDEWALK SHED
- FIRE ALARM
- SITE SAFETY PLAN (AS PER CHAPTER 33)
- FIRE PROTECTION PLAN (AS REQUIRED BY AC 28-109.2)
- ELEVATOR (AS PER BC §3302.4)
- S/D 1 & 2 (SITE CONNECTION)
- PARKS & RECREATIONS (TREES)

Jarmel Kizel
ARCHITECTS AND ENGINEERS INC.
42 OKNER PARKWAY
LIVINGSTON, NEW JERSEY 07039
TEL: 973-994-9669
FAX:973-994-4069
www.jarmelkizel.com
Architecture
Engineering
Interior Design
Implementation Services

ISSUE

NO.	DATE	DESCRIPTION	INT.
01	03.19.15	FILING & PRICING	MBJ

REVISION

NO.	DATE	DESCRIPTION	INT.

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DE LIC SS-00007256 | NC LIC 10320
FL LIC AR94034 | NH LIC 3501
GA LIC RA011484 | NY LIC 034673
IA LIC 05577 | OH LIC A-99-12444
IL LIC 001.020069 | PA LIC RA-014851-B
MA LIC AR10286 | TN LIC 103850
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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. 24GA 27811

10/03/2013

Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	Approved By: MBJ

Drawing Name:

TITLE SHEET

Drawing Number:

T-001.00

SHEET1of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL STATE OF NEW YORK 32473

3/31/2015 12:48:13 PM
File Path: H:\Drawings\Babaev Group\387 Manhattan Ave\Schematic Design\387 MAN - ARCHITECTURAL-60FT.rvt

BUILDING DEPARTMENT NOTES

1. WORK SHALL BE EXECUTED IN FULL COMPLIANCE WITH THE APPLICABLE PROVISIONS OF ALL LAWS, BY-LAWS, STATUTES, ORDINANCES, CODES, RULES, REGULATIONS AND LAWFUL ORDERS OF PUBLIC AUTHORmES BEARING ON THE PERFORMANCE AND EXECUTION OF THE WORI<. WORI< SHALL BE IN CONFORMANCE WITH THE 2014 CONSTRUCTION CODES.
THE CONTRACTOR SHALL PROMPTLY NOTIFY THE AUTHORITY OF ANY PORTIONS OF THE WORI<. IN THE CONTRACT DOCUMENTS THAT ARE AT VARIANCE WITH THE ABOVE.

2. THE CONTRACTOR SHALL CONSTRUCT STREETS AND STREET CURBING IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE BUREAU OF HIGHWAYS FOR THE BOROUGH IN WHICH THIS CONTRACT IS TO BE EXECUTED.

3. ALL MATERIALS, ASSEMBLIES. FORMS OF CONSTRUCTION AND SERVICE EQUIPMENT REGULATED BY CODE SHALL MEET THE FOLLOWING REQUIREMENTS:
a). THEY SHALL HAVE BEEN ACCEPTABLE PRIOR TO THE EFFECTIVE DATE OF THE CODE BY THE BOARD OF STANDARDS AND APPEALS OR MEA.
b). THEY SHALL HAVE BEEN ACCEPTED FOR THE USE UNDER THE PRESCRIBED TEST METHODS BY THE COMMISSIONER (OR)
c). APPROVED BY THE OFFICE OF TECHNICAL CERTIFICATION AND RESEARCH (OTCR)
d). SHALL BE LISTED AND LABELED BY DOB RECOGNIZED AGENCY TO MEET REQUIRED STANDARD.

4. MATERIALS OR ASSEMBLIES REQUIRED TO HAVE A FIRE RESISTANCE RATING SHALL COMPLY WITH ONE OF THE FOLLOWING:
a). THEY SHALL CONFORM WITH CHAPTER 7 OF THE 2014 NYC BUILDING CODE.
b). THEY SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ASTM E119 OR UL 263, STANDARD METHODS OF FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS BY A NATIONALLY RECOGNIZED AGENCY.
c). THEY SHALL HAVE BEEN ACCEPTABLE PRIOR TO THE EFFECTIVE DATE OF THE CODE.
d). APPROVED BY OTCR
5. ALL MASONRY UNITS AND MASONRY CONSTRUCTION SHALL CONFORM TO NYC BUILDING CODE, CHAPTER 21.
6. THE CONSTRUCTION CLASSIFICATION OF THE BUILDING IS "TYPE IB• (TABLE 601). THE CONSTRUCTION ELEMENTS SHALL BE OF THE REQUIRED MINIMUM FIRE RESISTANCE RATINGS AS OUTLINED IN TABLE 601 AND DEFINED IN CHAPTER 6 OF THE NYC BUILDING CODE. ALLOWABLE BUILDING HEIGHT AND AREAS SHALL NOT EXCEED AS OUTLINED IN TABLE 503.

7. THE VARIOUS OCCUPANCIES REQUIRED TO BE SEPARATED FROM EACH OTHER BY FIRE SEPARATION SHALL BE IN ACCORDANCE WITH BC 508.2 OR 508.3 AND TABLE 508.4. FIRE SEPARATIONS FOR INCIDENTAL USE AREAS SHALL BE IN ACCORDANCE WITH BC 509.4 AND TABLE 509.
8. AN ACCURATE AND COMPLETE FINAL LOT SURVEY BY A DULY LICENSED SURVEYOR REQUIRED BY SECTION 28-118.4 OF TITLE 28 SHALL BE FILED AS AN AMENDMENT BEFORE COMPLETION OF THE PROJECT.

9A. THE FOLLOWING WILL BE MADE UNDER SEPARATE APPLICATION BY THE DESIGN APPLICANT IN ACCORDANCE WITH SECTION 28-104.2.6 OF TITLE 28:

BUILDERS PAVEMENT PLAN	PRIOR TO T.C.O.
EMERGENCY GENERATOR	PRIOR TO PERMIT
FIRE ALARM	PRIOR TO PERMIT
FIRE PROTECTION PLAN	PRIOR TO T.C.O.
PLACES OF ASSEMBLY	PRIOR TO T.C.O.

9B. THE FOLLOWING SHALL BE MADE UNDER SEPARATE APPLICATION BY THE CONTRACTOR' S LICENSED PROFESSIONAL IN ACCORDANCE WITH SECTION 28-104.2.6 OF TITLE 28:

PERMANENT ELEVATORS	PRIOR TO T.C.O.
TEMPORARY ELEVATORS	PRIOR TO PERMIT
MECHANICAL & HAND DEMOLITION OPERATIONS	PRIOR TO PERMIT
SIDEWALK SHEDS	PRIOR TO PERMIT
CONSTRUCTION FENCES	PRIOR TO PERMIT
CHUTES. SCAFFOLDS. HOISTS	PRIOR TO PERMIT
KITCHEN FIRE SUPPRESSION SYSTEM	PRIOR TO T.C.O.
TEMPORARY STANDPIPE DURING CONSTRUCTION	PRIOR TO PERMIT
STRUCTURAL STABILITY	PRIOR TO PERMIT
EXCAVATION SHEETING SHORING.BRACING	PRIOR TO PERMIT
UNDERPINNING	PRIOR TO PERMIT
SEISMIC DESIGN FOR MECHANICAL,	PRIOR TO PERMIT
PLUMBING. FIRE PROTECTION & ELECTRICAL SYSTEMS	PRIOR TO PERMIT
SPRINKLER/STANDPIPE	PRIOR TO PERMIT

9C. THE ITEMS LISTED IN NOTES 9A AND 9B ABOVE TO BE FILED UNDER SEPARATE APPLICATION i.e. DEFERRED TO BE FILED, SHALL NOT BE CONSTRUCTED PRIOR TO OBTAINING SUCH PERMIT.

10. THE CONTRACTOR' S LICENSED PROFESSIONAL IS RESPONSIBLE FOR FILING APPLICATION AND OBTAINING PERMITS FOR SCAFFOLDING, SIDEWALK BRIDGING, ANY OTHER CONSTRUCTION EQUIPMENT OR PUBLIC PROTECTIVES REQUIRED TO ENSURE SAFETY OF OPERATION AND THE PUBLIC AS PER NYC CONSTRUCTION CODE,
CHAPTER 33, SECTION BC 3307. THE CONTRACTOR IS ALSO RESPONSIBLE FOR OBTAINING LETTER OF COMPLETION. APPLICATION FOR CONSTRUCTION PERMITS SHALL BE PROCESSED THROUGH THE BUILDING CODE
COMPLIANCE (BCC) DMSION OF THE AUTHORITY.

11• THE CONTRACTOR SHALL OBTAIN •cERTIFICATE OF COMPLIANCE• REQUIRED IN ACCORDANCE WITH CHAPTER 1 OF TITLE 28 OF THE ADMINISTRATIVE CODE, ARTICLE 116, 28-116.4.1. CERTIFICATE OF COMPLIANCE SHALL BE REQUIRED FOR THE USE AND OPERATION OF THE FOLLOWING TYPE OF SERVICE EQUIPMENT:
AIR-CONDmONING, VENTILATING AND EXHAUST SYSTEMS ELEVATORS, ESCALATORS, DUMBWAITERS ETC. FUEL-BURNING AND FUEL-OIL STORAGE EQUIPMENT
REFRIGERATION SYSTEMS HEATING SYSTEMS BOILERS

12. THESE DRAWINGS HAVE BEEN PREPARED BY OR AT THE DIRECTION OF THE UNDERSIGNED AND TO THE BEST OF THE UNDERSIGNED'S KNOWLEDGE. BELIEF AND PROFESSIONAL JUDGEMENT ARE IN COMPLIANCE WITH THE NYC CONSTRUCTION CODES,
INCLUDING THE NEW YORK CITY ENERGY CONSERVATION CODE.

13. ALL WORK SHALL COMPLY WITH SECTION BC 1007 AND CHAPTER 11 •ACCESSIBIUTY9 OF THE NYC BUILDING CODE AND ICC A117.1-2009.

14. ALL NEW WORK SHALL COMPLY WITH THE 2011 NEW YORK CITY ENERGY CONSERVATION CODE.
15. ALL NEW INTERIOR FINISHES SHALL BE CONSTRUCTED OF MATERIALS MEETING CHAPTER 8 FOR FLAME SPREAD AND SMOKE DEVELOPMENT RATINGS OF THE NYC BUILDING CODE.
16. ALL NEW WORK IS CONSTRUCTED MORE THAN 200'-0" FROM ANY MTA. NYCTA OR PA SUBWAY OR TUNNEL STRUCTURES. THE WORK INCLUDES FOUNDATIONS, EARTHWORK AND BURIED OIL TANKS.
17. ALL PLUMBING FIXTURES INSTALLED UNDER THIS CONTRACT SHALL COMPLY WITH TABLE 403.1 OF THE NYC PLUMBING CODE.
18. PANIC HARDWARE INSTALLED UNDER THIS CONTRACT SHALL BE AS PER SECTION BC 1008.1.10.

19. EXIT LIGHTING INSTALLED UNDER THIS CONTRACT SHALL BE AS PER SECTION BC 1006, WITH EMERGENCY POWER MEETING THE REQUIREMENTS OF SECTION 1006.3.
20. EXIT SIGNAGE INSTALLED UNDER THIS CONTRACT SHALL BE AS PER SECTION BC 1011, WITH EMERGENCY POWER MEETING THE REQUIREMENTS OF SECTION 1011.5.3.
21. EMERGENCY POWER, IF REQUIRED, UNDER THIS CONTRACT SHALL BE INSTALLED AS PER CHAPTER 27.

22. ALL AISLES LEADING TO EXITS SHALL BE CONSTRUCTED WITH A MINIMUM UNOBSTRUCTED WIDTH OF 3'-0" UNDER THIS CONTRACT.
23. FIRE ALARM PULL HANDLES INSTALLED UNDER THIS CONTRACT SHALL BE 4'-o• ABOVE THE FINISHED FLOOR TO THE TOP OF THE HANDLE.
24. SITE SAFETY PLANS SHALL BE SUBMITTED BY THE CONTRACTOR AND APPROVED BY THE AUTHORITY PRIOR TO APPLYING FOR CONSTRUCTION PERMITS.

25. GLAZING USED FOR SKYLIGHTS SHALL BE AS PER SECTION BC 2405.

26. NO SEPARATION IS REQUIRED BETWEEN ACCESSORY OCCUPANCY AND ITS MAIN OCCUPANCY AS PER BC 508.2.4. THE AGGREGATE OF ALL ACCESSORY OCCUPANCIES LOCATED ON A SINGLE STORY SHALL NOT OCCUPY MORE THAN 10" OF THE FLOOR AREA OF THE STORY IN WHICH THEY ARE LOCATED AS PER BC 508.2.1.

27. FOLLOW CHAPTER JJ OF THE 2014 NYC
BUILDING CODE FOR PROTECTION OF THE PUBLIC AND ADJACENT PROPERTIES.

28. LIST OF VIOLATIONS (IF ANY)

29.(A) ECC CHAPTER 5 HAS BEEN USED FOR DESIGN, AS REFLECTED IN THE ENERGY ANALYSIS. THE RESPECTIVE
REFERENCES AND CITATIONS FOR THE ECC ARE LISTED FOR THE PROGRESS INSPECTION.

(B) ASHRAE 90.1 HAS BEEN USED FOR DESIGN, AS REFLECTED IN THE ENERGY ANALYSIS, THE RESPECTIVE
REFERENCES AND CITATIONS FOR ASHRAE 90.1 ARE LISTED FOR THE PROGRESS INSPECTION.

JO. PROGRESS INSPECTIONS REQUIRED TO BE PERFORMED DURING CONSTRUCTION FOR ANY NEW BUILDING, ADDmON
OR ALTERATION PROJECT ARE IDENTIFIED BY THE APPLICANT ACCORDING TO THE SCOPE OF WORI< AND LISTED
AND DESCRIBED IN THE DRAWINGS. IN ACCORDANCE WITH SECTION
BC 109.9, WHERE AN INSPECTION OR TEST FAILS,
THE CONSTRUCTION SHALL BE CORRECTED.

31. IN ACCORDANCE WITH ARTICLE 116 OF TITLE 28 AND SECTION BC 109, CONSTRUCTION SHALL BE SCHEDULED
TO ALLOW REQUIRED PROGRESS INSPECTIONS TO TAKE PLACE, AND THAT ROOFS, CEILINGS, EXTERIOR WALLS,
INTERIOR WALLS, FLOORS, FOUNDATIONS, BASEMENTS AND ANY OTHER CONSTRUCTION SHALL NOT BE COVERED OR
ENCLOSED UNTIL REQUIRED PROGRESS INSPECTIONS ARE COMPLETED OR THE PROGRESS INSPECTOR INDICATES THAT
SUCH COVERING OR ENCLOSURE MAY PROCEED AT EACH STAGE OF CONSTRUCTION, AS APPLICABLE.

32. FIRE RATED DOOR AND FRAME ASSEMBLIES SHALL BE LABELED BY AN APPROVED AGENCY. THE LABELS SHALL COMPLY WITH NFPA 80, AND SHALL BE PERMANENTLY AFFIXED TO THE DOOR AND FRAME AS PER SECTION BC 715.4.6 OF THE 2014 NYC BUILDING CODE.

33. FIRESTOPPING SHALL BE INSPECTED IN ACCORDANCE WITH ASTM E2174 BY THE SPECIAL INSPECTOR.
34. ELECTROMAGNETICALLY LOCKED EGRESS DOORS SHALL COMPLY WITH BC 1008.1.9.8
35. FIRE DOOR FRAMES WITH TRANSOM LIGHTS AND SIDELIGHTS SHALL COMPLY WITH SECTION BC 715.4.5 OF THE 2014 NYC BUILDING CODE.

36. HEIGHTS OF PARAPETS/RAIL GUARDS IS TO BE 3'-6" MINIMUM ABOVE ADJACENT ROOF LEVEL IN ACCORDANCE WITH SECTION BC 1509.8 OF THE 2014 NYC BUILDING CODE.

37. HANDRAILS AND GUARDS SHALL BE DESIGNED TO RESIST THE LOADS AND TRANSFER SUCH LOADS TO THE STRUCTURE IN ACCORDANCE WITH SECTION BC 1607.7.1 OF THE 2014 BUILDING CODE.

REQUIRED FIRE RESISTANCE RATINGS:

BUILDING ELEMENT	REQUIRE RATINGS PER NYC BUILDING CODE TABLE 601 FOR IIB CONSTRUCTION	PROPOSED
STRUCTURAL FRAME	1 HOUR	2 HOUR
BEARING WALLS	1 HOUR	2 HOUR
NONBEARING WALLS	0 HOUR	0 HOUR
FLOOR CONSTRUCTION	1 HOUR	1 HOUR
ROOF CONSTRUCTION	1 HOUR	1 HOUR
TENANT SEPARATION	2 HOUR	2 HOUR
EXTERIOR WALLS		
	1 HR (FIRE SEPARATIONS DISTANCE) 0'-0" - 5'-0"	1 HOUR
	1 HR (FIRE SEPARATIONS DISTANCE) 5'-0" - 10'-0"	1 HOUR
	1 HR (FIRE SEPARATIONS DISTANCE) 10'-0" - 30'-0"	1 HOUR
	0 HR (FIRE SEPARATIONS DISTANCE) 30'-0" +	1 HOUR
EXTERIOR OPENINGS % OF EXTERIOR WALLS	10% (FIRE SEPARATIONS DISTANCE: 0' TO 5')	9.85%

PERMITED BUILDING SQUARE FOOTAGE

LOT AREA	COMMERCIAL	COMMUNITY FACILITY	RESIDENTIAL	MAX ALLOWED
5,000.00 SF	2.0	4.80	2.20	2.43* * ZR 123-64

MULTIPLE DWELLING LAW

HMC §27-2004.4; Class A multiple dwelling – HMC §27-2004.8(a)

MDL HMC Section 25 – Application of Article Three
• Title 1 – Light and Air §26.
Height, bulk open spaces (except 7); §28
Two or more buildings on same lot (except 3); §29.
Painting of courts and shafts; §30.
Lighting and ventilation of rooms; §31
Size of rooms; §32.
Alcoves; §33.
Cooking spaces; §34.
Rooms in basements and cellars; §35.
Entrance doors and lights
• Title 2 – Fire Protection and Safety §50a.
Entrance doors, locks and intercommunication systems; §50-c.
Rights of tenants to operate and maintain a lobby attendant service; §51-a.
Peepholes; §51-b.
Mirrors in connection with self-service elevators; §51-c.
Rights of tenants to install and maintain locks in certain entrance doors; §54.
Cellar entrance; §56.
Frame buildings and extensions; §57
Bells; mail receptacles; §58.
Incombustible materials; §59.
Bakeries and fat boiling; §62.
Parapets, guard railings and wires;§63.
Sub-curb uses; §64.
Lighting; gas meters; gas and oil appliances; §65.
Boiler rooms; §66.
Lodging houses; §68.
Smoke detecting devices
• Title 3 – Sanitation and Health §75.
Water supply (3. only); §76.
Water closet and bath accommodations; §77.
Plumbing and drainage; §78.
Repairs; §79. Heating; §80.
Cleanliness; §81.
Receptacles for waste matter; §82.
Privacy; §83.
Janitor and housekeeper; §84.

SMOKE DETECTOR NOTES
a. CONTRUCTOR SHALL INSURE THAT SMOKE ALARM DETECTORS ARE PROVIDED AND INSTALLED PER SECTIONS BC 907.2.10.1.1 THROUGH 907.2.10.5 OF THE 2008 NYC BUILDING CODE OUTSIDE OF EACH ROOM USED FOR SLEEPING PURPOSES WITHIN 15 FEET FROM THE DOOR AND ALSO IN SUCH ROOM. AT SPLIT LEVELS WITHOUT AN INTERVENING DOOR BETWEEN LEVELS, A SMOKE ALARM INSTALLED IN THE UPPER LEVEL SHALL SUFFICE FOR THE BOTH LEVELS IF THE LOWER IS LESS THAN ONE FULL STORY BELOW
b. REQUIRED SMOKE ALARMS SHALL RECEIVE PRIMARY POWER FROM A DEDICATED BRANCH CIRCUIT OR THE UNSWITCHED PORTION OF A BRANCH CIRCUIT USED FOR POWER AND LIGHTING AND EQUIPPED WITH A BATTERY BACKUP
c. WHERE MORE THAN ONE SMOKE ALARM IS REQUIRED, INTERCONNECT SO THAT ACTIVATION OF ONE WILL ACTIVATE ALL.
d. TEST EACH DETECTOR AND INTERCONNECTING WIRING PER NFPA 72. SMOKE ALARMS SHALL BE ABLE TO SUPPORT VISIBLE ALARM NOTIFICATION PER ICC/ANSI A117.1
e. A CERTIFICATION OF SATISFACTORY INSTALLATION MUST BE FILED WITH THE DIVISION OF CODE ENFORCEMENT H.P.D. TEN DAYS AFTER THE INSTALLATION.

CARBON MONOXIDE DETECTOR NOTES
a. CONTRUCTOR SHALL INSURE THAT CARBON MONOXIDE DETECTORS ARE PROVIDED AND INSTALLED PER SECTIONS BC 908.7.1 THROUGH 907.1.1.2 OF THE 2008 NYC BUILDING CODE WITHIN UNITS ON, AND ABOVE AND BELOW, THE SAME STORY WHERE CARBON MONOXIDE-PRODUCING EQUIPMENT OR ENCLOSED PARKING IS LOCATED, AND IN A BOILER, OR WATER HEATER AS PART OF A CENTRAL SYSTEM. CARBON MONOXIDE DETECTORS SHALL BE INSTALLED WITHIN 15 FEET OUTSIDE OF ANY ROOM USED FOR SLEEPING PURPOSES AS WELL AS WITHIN IT. CARBON MONOXIDE DETECTORS SHALL COMPLY WITH THE POWER SOURCE, INTERCONNECTION, AND ACCEPTANCE TESTING REQUIREMENTS REQUIRED FOR SMOKE ALARMS PER SECTIONS 907.2.10.2 THROUGH 907.2.10.4 OF THE NYC BUILDING CODE

Sec. [D26-1.07] 27-2004 Definitions.
a. The following terms, as used in this chapter, shall have the following meanings:
1. The term department shall mean the department, bureau, division or other agency charged with the enforcement of this title.
2. Wherever the word or words occupied, is occupied, used or is used appear such word or words shall be construed as if followed by the words "or is intended, arranged or designed to be used or occupied."
3. A dwelling is any building or structure or portion thereof which is occupied in whole or in part as the home, residence or sleeping place of one or more human beings.
4. A family is (i) a single person, or (ii) two or more persons related by blood or marriage, occupying a dwelling unit and maintaining a common household with not more than two boarders, roomers or lodgers; or (iii) not more than three unrelated persons occupying a dwelling unit and maintaining a common household. A boarder, roomer or lodger is a person who pays a consideration for living within the household and does not occupy such space as an incident of employment. Foster children lawfully living with the family in accordance with the provisions of the social services law are considered to be members of the family. A common household is deemed to exist if every member of the family has access to all parts of the dwelling unit.
5. "Person," for the purposes of article four of subchapter three of this chapter, means any adult or child over the age of four years. The term "person" as used in subchapters four and five of this code shall include the owner, mortgagee or vendee in possession, assignee of rents, receiver, executor, trustee, lessee, agent or any other person, firm or corporation directly or indirectly in control of a dwelling or part thereof. Whenever a multiple dwelling shall have been declared a public nuisance to any extent pursuant to section 27-2114 of article one of subchapter five of this chapter and such declaration shall have been filed as therein provided, the term "person" shall be deemed to include in addition to those mentioned hereinabove, all the officers, directors and persons having an interest in more than ten percent of the issued and outstanding stock of the owner as herein defined, as holder or beneficial owner thereof, if such person be a corporation other than a banking organization as defined in section two of the banking law, a national banking association, a federal savings and loan association, the Mortgage Facilities Corporation, Savings Bank Life Insurance Fund, The Savings Banks Retirement System, an authorized insurer as defined in section one hundred seven of the insurance law, or a trust company or other corporation organized under the laws of this state all the capital stock of which is owned by at least twenty savings banks or by at least twenty savings and loan associations or a subsidiary corporation all of the capital stock of which is owned by such trust company or other corporation.
6. A private dwelling is any building or structure designed and occupied for residential purposes by no more than two families. Private dwellings shall also be deemed to include a series of one-family or two-family dwelling units each of which faces or is accessible to a legal street or public thoroughfare, if each such dwelling unit is equipped as a separate dwelling unit with all essential services, and if each such unit is arranged so that it may be approved as a legal one-family or two-family dwelling.
7. A multiple dwelling is a dwelling which is either rented, leased, let or hired out, to be occupied, or is occupied, as the residence or home of three or more families living independently of each other. A multiple dwelling shall also include residential quarters for members or personnel of any hospital staff, which are not located in any building used primarily for hospital use, but any building which was erected, altered or converted prior to July first, nineteen hundred fifty-five, to be occupied by such members or personnel or is so occupied on such date shall not be subject to the requirements of this code only so long as it continues to be so occupied if there are local laws applicable to such building and such building is in compliance with such local laws. A multiple dwelling does not include (i) a hospital, convent, monastery, asylum or public institution; or (ii) a fireproof building used wholly for commercial purposes except for not more than one janitor's apartment and not more than one penthouse occupied by not more than two families. For the purposes of this chapter, multiple dwellings are divided into two classes: "Class A" and "Class B."
8. (a) A Class A multiple dwelling is a multiple dwelling which is occupied, as a rule, for permanent residence purposes. This class shall include tenements, flat houses, maisonette apartments, apartment houses, apartment hotels, bachelor apartments, studio apartments, duplex apartments, kitchenette apartments, garden-type maisonette dwelling projects, and all other multiple dwellings except Class B multiple dwellings. (b) A garden-type maisonette dwelling project is a series of attached, detached or semi detached dwelling units, which are provided as a group collectively with all essentials services such as, but not limited to, water supply and house sewers, and which units are located on a site or plot not less than twenty thousand square feet in are under common ownership and erected under plans filed with the department on or after April eighteenth, nineteen hundred fifty four, and which units together and in their aggregate are arranged or designed to provide three or more apartments.
9. A Class B multiple dwelling is a multiple dwelling which is occupied, as a rule, transiently, as the more or less temporary abode of individuals or families who are lodged with or without meals. This class includes hotels, lodging houses, rooming houses, boarding houses, boarding schools, furnished room houses, lodgings, club houses, and college and school dormitories.
10. A converted dwelling is a dwelling (i) erected before April eighteenth, nineteen hundred twenty-nine, to be occupied by one or two families living independently of each other and subsequently occupied as a multiple dwelling or (ii) a dwelling three stories or less in height erected after April eighteenth, nineteen hundred twenty-nine, to be occupied by one or two families living independently of each other and subsequently occupied by not more than three families in all, with a maximum occupancy of two families on each floor in a two story building and one family on each floor in a three story building. A converted dwelling occupied as a Class A multiple dwelling is a Class A converted dwelling; every other converted dwelling is a Class B converted dwelling.
11. A tenement is any building or structure or any portion thereof; erected before April eighteenth, nineteen hundred twenty-nine, which is occupied, wholly or in part, as the residence of three families or more living independently of each other and doing their cooking upon the premises and includes apartment houses, flat houses and all other houses so erected and occupied, except that; tenement shall not be deemed to include any converted dwelling. An old law tenement is a tenement existing before April twelfth, nineteen hundred one, and recorded as such in the tenement house department before April eighteenth, nineteen hundred twenty-nine, except that it shall not be deemed to include any converted dwelling.
12. A hotel is an inn having thirty or more sleeping rooms.
13. Dwelling unit shall mean any residential accommodation in a multiple dwelling or private dwelling.
14. Apartment shall mean one or more living rooms, arranged to be occupied as a unit separate from all other rooms within a dwelling, with lawful sanitary facilities and a lawful kitchen or kitchenette for the exclusive use of the family residing in such unit.
15. Rooming unit shall mean one or more living rooms arranged to be occupied as a unit separate from all other living rooms, and which does not have both lawful sanitary facilities and lawful cooking facilities for the exclusive use of the family residing in such unit. It may be located either within an apartment or within any Class A or Class B multiple dwelling. A rooming unit shall not include a living room in a Class B hotel or any other dwelling complying with section 67 of the multiple dwelling law and so classified and recorded in the department.
16. Rooming house shall mean a Class B converted dwelling with more than half of the rooms in rooming units.
17. Single room occupancy is the occupancy by one or two persons of a single room, or of two or more rooms which are joined together, separated from all other rooms within an apartment in a multiple dwelling, so that the occupant or occupants thereof reside separately and independently of the other occupant or occupants of the same apartment. When a Class A multiple dwelling is used wholly or in part for single room occupancy, it remains a Class A multiple dwelling.
18. A lodging house is a multiple dwelling, other than a hotel, a rooming house or a furnished room house, in which persons are housed for hire for a single night or for less than a week at one time, or any part of which is let for any person to sleep in for any term less than a week.
19. Public hall shall mean a hall, corridor or passageway within a building but outside of all apartments and suites of private rooms.
20. Public part of a dwelling includes a public hall and any space used in common by the occupants of two or more apartments or rooms, or by persons who are not tenants, or exclusively for mechanical equipment of such dwelling or for storage purposes.
21. Living room shall mean any room within a dwelling unit except a dining space, kitchenette, bathroom or water closet compartment, foyer or private hall, corridor or passageway.
22. The floor area is the clear area of the floor contained within the partitions or walls enclosing any room, space, foyer, hall or passageway of any dwelling.
23. Dining space shall mean a space with 55 square feet or less of floor area, which has such permanent fittings as the department requires, located off a living room, foyer or kitchen. A dining space includes a dining bay, dining recess or dinette.
24. Foyer shall mean a space within a dwelling unit in multiple dwelling used as an entrance hall from the public hall, which is not a living room when its floor area does not exceed either: (a) 10 per cent of the total floor area of the dwelling unit: or (b) 20 per cent of such floor area, if every living room is at least 20% larger than the required minimum room size.
25. Kitchen shall mean a living room used for cooking with 59 square feet or more of floor area.
26. Kitchenette shall mean a space used for cooking with less than 59 square feet of floor area.
27. Dormitory shall mean a space occupied for sleeping purposes by three or more persons who are not members of a family maintaining a common household in a. A lodging house, except for an apartment occupied solely by an owner, janitor or superintendent; orb. A college or school dormitory legally recorded and classified in the department prior to May 15, 1954, or converted to such use prior to April 30, 1956; or c. A dwelling owned and operated by a religious, charitable or educational organization for the purposes enumerated in section 27-2077 of article four of subchapter three of this chapter; or d. A dwelling owned, operated or used for the purposes enumerated in section 27-2077 of article four of subchapter three of this chapter.
28. Premises shall mean land and improvements or appurtenances or any part thereof.
29. Structure shall mean a building or construction of any kind.
30. Alteration, as applied to a building or structure, shall mean any change or rearrangement in the structural parts or in the existing facilities of any such building or structure, or any enlargement thereof, whether by extension on any side or by any increase in height, or the moving of such building or structure from one location or position to another.
31. A multiple dwelling is fireproof if the walls and structural members thereof meet the fire resistive standards set forth in subdivision 25 of section four of the multiple dwelling law. Any other multiple dwelling is non-fireproof. A part of a dwelling is fireproof if it meets the standard set forth in the multiple dwelling law for the corresponding part of a fireproof dwelling.
32. Fire-retarded shall mean either covered with metal lath plastered with two or more coats of mortar or otherwise protected against fire in a manner approved by the department with materials of standard fire-resistive [sic] ratings of at least one hour. Fireproofing shall always be accepted as meeting any requirement for fire-retarding.
33. A rear yard is an open space on the same lot with a dwelling between the extreme rear line of the lot and the extreme rear wall of the dwelling. A side yard is a continuous open space on the same lot with a dwelling between the wall of a dwelling and a line of the lot from the street to a rear yard or rear line of a lot.
34. A court is an open space other than a side or rear yard, on the same lot as a dwelling. A court not extending to the street or rear yard is an inner court. A court extending to the street or rear yard is an outer court
35. A story is a space between the level of one finished floor and the level of the next higher finished floor, or, if the top story, the space between the level of the highest finished floor and the top of the highest roof beams, or, if the first story, the space between the level of the finished floor and the finished ceiling immediately above. For the purpose of measuring height by stories in multiple dwellings erected after April 18, 1929, one additional story shall be added for each twelve feet or fraction thereof that the first story exceeds fifteen feet in height, and for each twelve feet or fraction thereof that any story above the first story exceeds twelve feet in height.
36. Except as otherwise provided, the curb level, for the purpose of measuring the height of any portion of a building, is the level of the curb at the center of the front of the building; except that where a building faces on more than one street, the curb level is the average of the levels of the curbs at the center of each front. Where no curb elevation has been established the mean level of the land immediately adjacent to the building prior to any excavation or fill shall be considered the curb level, unless the city engineer shall establish such curb level or its equivalent.
37. A cellar in a dwelling is an enclosed space having more than one-half of its height below the curb level. A cellar shall not be counted as a story.
38. A basement is a story partly below the curb level but having at least one-half of its height above the curb level. A basement shall be counted as a story.
39. A shaft is an enclosed space extending through one or more stories of a building connecting a series of openings therein, or any story or stories and the roof, and includes exterior and interior shafts whether for air, light, elevator, dumbwaiter or any other purpose.
40. A stair is a flight or flights of steps together with any landings and parts of public halls through which it is necessary to pass in going from one level thereof to another.
41. A fire-stair is a fireproof stair, enclosed in fireproof walls, within the body of the building, which it serves, to which access may be had only through self-closing fireproof doors.
42. A fire-tower is a fireproof stair, enclosed in fireproof walls, without access to the building from which it affords egress other than by a fireproof self-closing door opening on a communicating balcony or other outside platform at each floor level.
43. A fire escape is a combination of outside balconies and stairs providing an unobstructed means of egress from rooms or spaces in a building.
44. Window dimensions shall always be taken between stop beads or, if there are no stop beads, between the sides, head and sill of the sash opening.
45. The term "owner" shall mean and include the owner or owners of the freehold of the premises or lesser estate therein, a mortgagee or vendee in possession, assignee of rents, receiver, executor, trustee, lessee, agent, or any other person, firm or corporation, directly or indirectly in control of a dwelling. Whenever a multiple dwelling shall have been declared a public nuisance to any extent pursuant to section 27-2114 of article one of subchapter five of this of this chapter and such declaration shall have been filed as therein provided, and for the purposes of section 27-198 of article nineteen of subchapter one and section 27-2093 of article one of subchapter four of this code, the term "owner" shall be deemed to include, in addition to those mentioned hereinabove, all the officers, directors and persons having an interest in more than ten per cent of the issued and outstanding stock of the owner as herein defined, as holder or beneficial owner thereof, if such owner be a corporation other than a banking organization as defined in section two of the banking law, a national banking association, a federal savings and loan association, The Mortgage Facilities Corporation, Savings Banks Life Insurance Fund, The Savings Banks Retirement System, an authorized insurer as defined in section one hundred seven of the insurance law, or a trust company or other corporation organized under the laws of this state all the capital stock of which is owned by at least twenty savings banks or by at least twenty savings and loan associations or a subsidiary corporation all of the capital stock of which is owned by such trust company or other corporation.
46. Summer resort dwelling shall mean a dwelling located in a summer resort community, which is occupied in whole or in part for living purposes only for a seasonal period of the year between June 1 and September 30, other than by the family of the owner or the family of a caretaker.
47. This code shall mean the housing maintenance code.

b. Except as otherwise provided herein, all terms used in this chapter shall be construed in a manner consistent with their use in the multiple dwelling law.

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Architecture
Engineering
Interior Design
Implementation Services

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01	03.19.15	FILING & PRICING	MBJ

REVISION

NO.	DATE	DESCRIPTION	INT.

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FL LIC ARS9034 — NH LIC 3501
GA LIC RA011484 — NY LIC 024673
IA LIC 05577 — OH LIC A-99-12444
IL LIC 001.020069 — PA LIC RA-014851-B
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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA-27817
10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
Drawn By: CAPSTN-S-14-193	Approved By: AS NOTED

Drawing Name: MBJ

BUILDING DEPARTMENT & MDL HMC NOTES

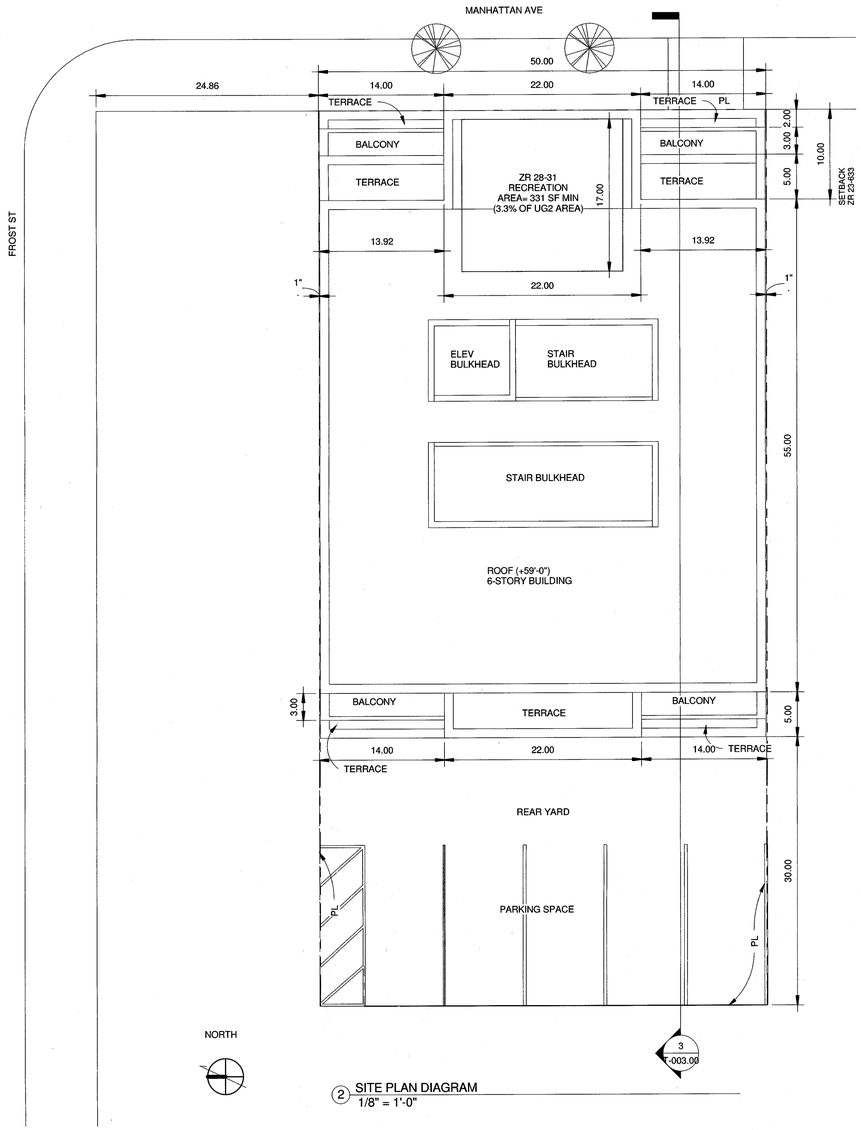
Drawing Number:

T-002.00

REGISTERED ARCHITECT — MATTHEW B. JARMEL — 24875 — OF NEW YORK

SHEET 2 of 102

3/20/2015 2:06:19 P.M.
File Path: H:\Drawings\Babcev Group\387 Manhattan Ave\Schematic Design\387 MAN - ARCHITECTURAL-60FT.rvt



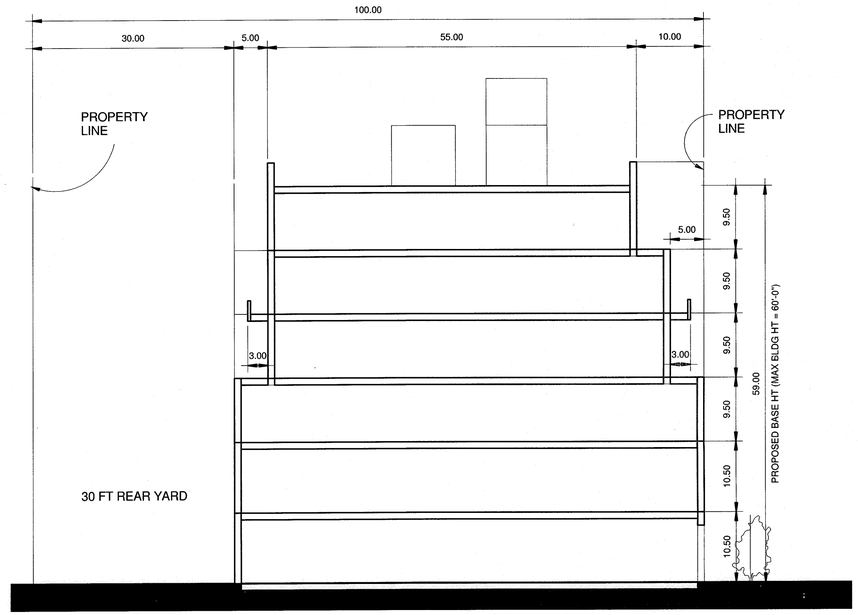
2 SITE PLAN DIAGRAM
1/8" = 1'-0"

LEGEND

ZONING LOT / PROPERTY LINE

PROPOSED BUILDING

PROPOSED TREES



3 Section 1
3/32" = 1'-0"

ZONING ANALYSIS

REFER T-100 FOR BALANCE OF INFORMATION

Project Address	:	387 MANHATTAN AVE, BROOKLYN, NEW YORK
Zoning District	:	M1-2/R6
Special District	:	MX-8
Block #	:	2738
Lot #	:	21
Type of Lot	:	With-in 100'-0" from Corner
Lot Frontage(s)	:	50'-0" Manhattan Ave
Lot Area	:	50'-0" x 100'-0" = 5,000 sf

ZONING RESOLUTION SECTIONS	ALLOWABLE / REQUIRED	PROVIDED / PROPOSED
ZR 23-145 (QUALITY HOUSING) RESIDENTIAL FAR - R6	2.20	1.70 - Complies
ZR 24-11 (Community Facility) FAR	4.80	1.40 - Complies
ZR 43-12 (Commercial) FAR	2.00	0.10 - Complies
ZR 23-145 (R6) RESIDENTIAL (MAX FA)	11,000.00 SF	10,031.00 SF - Complies
ZR 24-11 (Community Facility) (MAX FA)	24,000.00 SF	6,976.00 SF - Complies
ZR 43-12 (Commercial) FAR (MAX FA)	10,000.00 SF	525.00 SF - Complies
ZR 123-64 Max Maximum Lot Coverage and Maximum Floor Area Ratio - MIXED USE (b) Lot coverage shall NOT apply.		
ZR 123-65 Yard Regulations	ZR 123-651 Front Yard/Side Yard	
	NONE Required	

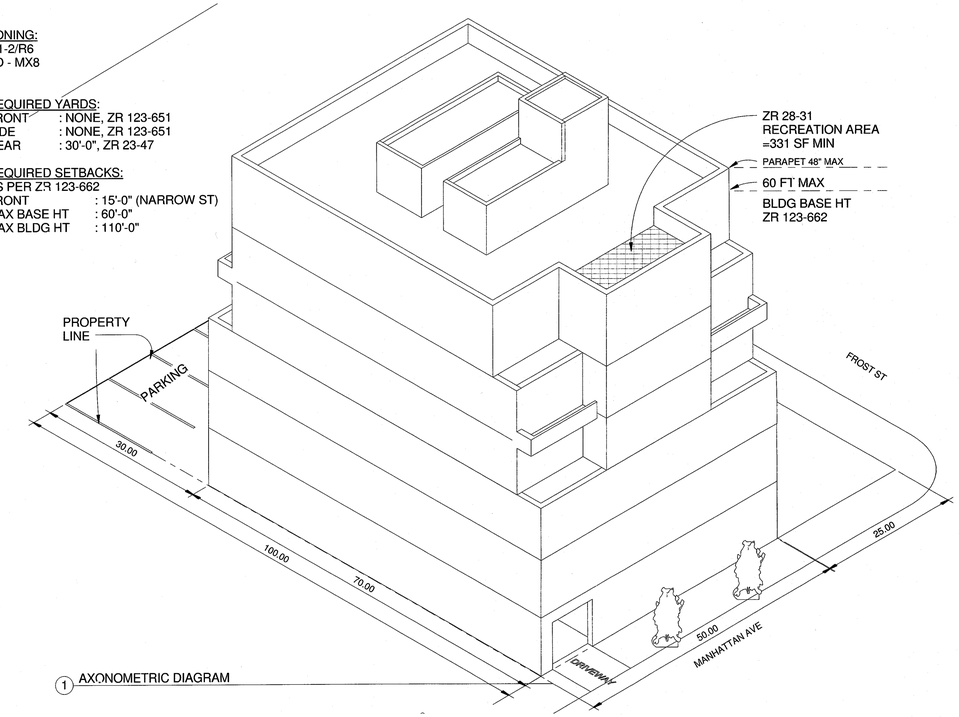
FLOOR AREA CALCULATIONS

LEVEL	COMM FAC GFA (SF)	RETAIL (SF)	R-2 GFA (SF)	TOTAL GFA (SF)	REMARKS
1ST FLOOR	560	525.00	2,403.00	3,488.00	
2ND FLOOR	3,488.00	0	0	3,488.00	
3RD FLOOR	3,488.00	0	0	3,488.00	
4TH FLOOR	0	0	2,911.00	2,911.00	
5TH FLOOR	0	0	2,911.00	2,911.00	
6TH FLOOR	0	0	2,571.00	2,571.00	
ROOF					331.00 SF RECREATION AREA
TOTAL	7,536.00 SF	525.00 SF	10,796.00 SF	18,857.00 SF	

ZONING:
M1-2/R6
SD - MX8

REQUIRED YARDS:
FRONT : NONE, ZR 123-651
SIDE : NONE, ZR 123-651
REAR : 30'-0", ZR 23-47

REQUIRED SETBACKS:
AS PER ZR 123-662
FRONT : 15'-0" (NARROW ST)
MAX BASE HT : 60'-0"
MAX BLDG HT : 110'-0"



1 AXONOMETRIC DIAGRAM

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FL LIC AR94034 — NH LIC 3501
GA LIC RA011484 — NY LIC 024573
IA LIC 05577 — OH LIC A-99-12444
IL LIC 001.020069 — PA LIC RA-014851-B
MA LIC AR10286 — TN LIC 103850
MD LIC 12662 — TX LIC 20992
VA LIC 0401 014089
VT LIC 2453

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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyers Authorization No. "GA-27811"
10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:** MBJ

Drawing Name:
ZONING ANALYSIS

Drawing Number:
T-003.00

SHEET3of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL No. 32457 STATE OF NEW YORK

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RESIDENTIAL		
SECTION	REQUIREMENT	PROPOSAL
12-10 Definitions Base Plane	...within 100 feet of a #street line#, the level of the #base plane# is any level between #curb level# and #street wall line level#.	Complies. Street wall line / property line elevation is 11.96' THIS ELEVATION IS OUR BASE PLANE AND REFERENCE AS PROJ DATUM 0.0
23-145 Minimum Required Open Space, Open Space Ratio, Maximum Lot Coverage and Maximum Floor Area Ratio For Quality Housing buildings	In the districts indicated, the maximum #residential lot coverage# and the maximum #floor area ratio# for a #zoning lot# where #Quality Housing buildings# are #developed# or #enlarged# shall be 2.20	Complies. PROPOSED RESIDENTIAL FAR = 1.70
23-22 / 35-40 Maximum Number of Dwelling Units or Rooming Units	In all districts, as indicated, the maximum number of #dwelling units# or #rooming units# shall equal the maximum #residential floor area# permitted on the #zoning lot# divided by the applicable factor of 790/DU	Complies. 10,031 sf / 760 DU Factor =12.69 DU Propose Max. number of Dwelling units = 12 DU
23-44 Permitted Obstructions in Required Yards or Rear Yard Equivalents	In all #Residence Districts#, the following obstructions shall be permitted within a required #yard# or #rear yard equivalent#: (3) Awnings and other sun control devices, provided that when located at a level higher than the first #story#, excluding a #basement#, all such awnings and other sun control devices: (i) shall be limited to a maximum projection from a #building# wall of 2 feet, 6 inches; and (ii) shall have solid surfaces that, in aggregate, cover an area no more than 30 percent of the area of the #building# wall (as viewed in elevation) from which they project;	Complies.
23-47 Minimum Required Rear Yards	In all districts, as indicated, a #rear yard# with a depth of not less than 30 feet shall be provided at every #rear lot line# on any #zoning lot#	Complies. Rear yard of 30'-0" provided
26-142 Street wall articulation	When any #building# wall of a #development# that is five feet or more in height adjoins a sidewalk, a #public plaza# or an #arcade#, at least 25 percent of the total surface area of such walls between #curb level# and 12 feet above #curb level# or to the ceiling of the ground floor, whichever is higher, or to the full height of the wall if such wall is less than 12 feet in height, shall be transparent. The lowest point at any point of any transparency that is provided to satisfy the requirements of this Section shall not be higher than four feet above the #curb level#.	Complies.
ZR 123-662	In the districts indicated, #street wall# location and height and setback regulations are set forth in this Section. The height of all #buildings or other structures# shall be measured from the #base plane#. R6 district outside of Manhattan core Max Base Height permitted on Narrow Street = 60'-0"	Complies. Max. Base Height proposed on Narrow Street = 60'-0" Max. Building Height proposed on Narrow Street = 59'-0"'
23-89 Open Area Requirements for Residences 23-892 In R6 through R10 Districts	In the districts indicated without a letter suffix, on #zoning lots# containing a #Quality Housing building#, the entire area of the #zoning lot# between the #street line# and all #street walls# of the #building# and their prolongations shall be planted at ground level, or in raised planting beds that are permanently affixed to the ground, except that such plantings shall not be required at the entrances to and exits from the #building# within driveways accessing off-street parking spaces located within, to the side, or rear of such #building#, or between #commercial uses# and the #street line#.	N/A There's no area between the street line and the street wall.
26-41 Street Tree Planting	In accordance with applicability requirements of underlying district regulations, one #street# tree, pre-existing or newly planted, shall be provided for every 25 feet of #street# frontage of the #zoning lot#.	BPP and Parks submissions are being submitted separately (2)TWO tree on site is being provided. see Site Plan Diagram 1 / Z-100.
	QUALITY HOUSING	
SECTION	REQUIREMENT	PROPOSAL
28-21 Size of Dwelling Units 28-22 Windows 28-23 Refuse Storage and Disposal	A #dwelling unit# shall have an area of at least 400 square feet of #floor area#. All windows in the #residential# portion of a #development# or #enlargement# shall be double glazed. The storage of refuse shall occur entirely within an enclosed area on the #zoning lot# and appropriate locations within the #zoning lot# shall be delineated for this purpose: at least one for #residential uses# and at least one for #community facility# and #commercial uses#. #Residential# storage and removal locations shall be provided at the rate of 2.9 cubic feet per #dwelling unit# or 1.15 cubic feet per #rooming unit#. A refuse disposal room of not less than twelve square feet with no dimension less than three feet shall be provided on each #story# that has entrances to #dwelling units# or #rooming units#. Twelve square feet of such refuse storage room shall be excluded from the definition of #floor area#.	Complies. DU Proposed (Smallest) Area = 450 SF REFER APARTMENT SCHEDULE Complies. ALL WINDOWS TO BE DOUBLE GLAZED Complies. REFUSE CHUTE & ROOM IS PROVIDED ON EACH LEVEL
28-31 Required Recreation Space	All #developments#, #enlargements#, #extensions# or #conversions#, with nine or more #dwelling units# or #rooming units#, shall provide at least the minimum amount of recreation space as set forth in the table in this Section.	Complies. Min. Requirement is 331 SF (3.3% of Residential Floor Area) 10,031 sf x 3.3% = 331 SF Provided at Roof Level (REFER SITE PLAN)
28-41 Density per Corridor	Requirements is 11 (Eleven Units or Less)	Complies. Proposed : 4 DU

COMMERCIAL		
SECTION	REQUIREMENT	PROPOSAL
33-12 Maximum Floor Area Ratio 33-121 In districts with bulk governed by Residence District bulk regulations	In the districts indicated, for a #zoning lot# containing a #commercial# or #community facility use#, the maximum #floor area ratio# is determined by the #Residence District# within which such #Commercial District# is mapped and shall not exceed the maximum #floor area ratio# set forth in the following table: For #Zoning Lots# Containing both #Commercial# and #Community Facility Uses# 4.8 FAR	Complies.
33-23 Permitted Obstructions in Required Yards or Rear Yard Equivalents	In all #Commercial Districts#, the following obstructions shall be permitted when located within a required #yard# or #rear yard equivalent#: (5) Eaves, gutters or downspouts, projecting into such #yard# or #rear yard equivalent# not more than 16 inches or 20 percent of the width of such #yard# or #rear yard equivalent#, whichever is the lesser distance;	Complies.
33-26 Minimum Required Rear Yards	In all districts, as indicated, a #rear yard# with a depth of not less than 20 feet shall be provided at every #rear lot line# on any #zoning lot# except as otherwise provided in Sections 33-27 (Special Provisions for Shallow Interior Lots), 33-28 (Special Provisions for Through Lots) or 33-30 (OTHER SPECIAL PROVISIONS FOR REAR YARDS).	Complies.
36-20 REQUIRED ACCESSORY OFF-STREET PARKING SPACES FOR COMMERCIAL OR COMMUNITY FACILITY USES	1 per 1,000 sq. ft. of #floor area# - C1-4 C2-4	N/A SEE BELOW
36-23 Waiver of Requirements for Spaces below Minimum Number 36-232 In districts with very low parking requirements	(a) #commercial uses# in parking requirement category A or B, if the total number of #accessory# off-street parking spaces required for all such #uses# on the #zoning lot# is less than 40, or 100 in the case of C6-1A Districts; or (b) #commercial uses# in any one of parking requirement categories B1, C, D, E, or H, or a permitted #community facility use#, if the number of #accessory# off-streetparking spaces required for the #uses# in each such categoryor for each such #community facility use# is less than 40.	
36-341 DWELLING UNITS PARKING REQUIREMENTS	50% NUMBER OF DWELLING UNITS	Complies. The required number of parking spaces is 6 SPACES. (12 DU) PROVIDED : 6 Spaces, COMPLY
24-162 Maximum floor area ratios and special floor area limitations for zoning lot containing residential and community facility uses in certain districts	(a) For #buildings# containing #residential# and #community facility uses#, if the ratio of #floor area# provided in a #building# to the #lot area# of the #zoning lot# is greater than as set forth in Column A in the table in this Section, then the maximum ratio of #community facility floor area# in such #buildings# to the #lot area# of the #zoning lot# shall be as set forth in Column B in the table. Column A value R6 = 2.50 Column B value R6 = 1.00	Complies. Proposed Column A value = 3.43 > 2.5 Proposed Column B value = .41 > 1.0

387 MANHATTAN AVE APARTMENT SCHEDULE

APARTMENT	# UNITS	AREA	# BEDROOMS	# BATHROOMS
UNIT 4A	1	577 SF	1	1
UNIT 4B	1	568 SF	1	1
UNIT 4C	1	577 SF	1	1
UNIT 4D	1	568 SF	1	1
UNIT 5A	1	577 SF	1	1
UNIT 5B	1	568 SF	1	1
UNIT 5C	1	577 SF	1	1
UNIT 5D	1	568 SF	1	1
UNIT 6A	1	525 SF	1	1
UNIT 6B	1	450 SF	-	1
UNIT 6C	1	525 SF	1	1
UNIT 6D	1	450 SF	-	1
TOTALS	12	6,530 SF	10	12

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Architecture
Engineering
Interior Design
Implementation Services

ISSUE

NO.	DATE	DESCRIPTION	INT.
01	03.19.15	FILING & PRICING	MBJ

REVISION

NO.	DATE	DESCRIPTION	INT.

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DC LIC ARC-101849 — MN LIC 46404
DE LIC S5-0007256 — NC LIC 10120
FL LIC AR94034 — NH LIC 3501
GA LIC RA011484 — NY LIC 024673
IA LIC 05577 — OH LIC A-99-12444
IL LIC 001-020069 — PA LIC RA-014851-B
MA LIC AR10286 — TN LIC 103850
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JOHN TUDOR, RA — NY LIC 023617 / NJ LIC 21AI012660
FREDRICK KINCAID, RA — NJ LIC 21AI018294

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T-004.00

SHEET 4 of 102

Initial Date:

REGISTERED ARCHITECT — MATTHEW B. JARMEL — STATE OF NEW YORK

ABBREVIATIONS

NOTE: REFER TO ENGINEER DRAWINGS FOR ENGINEERING ABBREVIATION LISTS

STANDARD ABBREVIATIONS

SYMBOLS USED AS ABBREVIATIONS	
&	AND
∠	ANGLE
@	AT SPACING OF
B.M.	BENCH MARK
℄	CENTER LINE
⊏	CHANNEL
#	NUMBER
d	PENNY
⊥	PERPENDICULAR
ℙ	PLATE
ϕ	ROUND
▯	SQUARE
X	WIDTH X HEIGHT
W/	WITH

ABBREVIATIONS	
ABV	ABOVE
AFF	ABOVE FINISHED FLOOR
ACC	ACCESS
ACFL	ACCESS FLOOR
AP	ACCESS PANEL
AC	ACOUSTICAL
ACPL	ACOUSTICAL PLASTER
ACT	ACOUSTICAL TILE
ACR	ACRYLIC PLASTIC
ADH	ADHESIVE
ADJ	ADJACENT
ADJT	ADJUSTABLE
AGG	AGGREGATE
A/C	AIR CONDITIONING
ALT	ALTERNATE
AL	ALUMINUM
ANC	ANCHOR, ANCHORAGE
AB	ANCHORBOLT
ANOD	ANODIZED
ARCH	ARCHITECT, ARCHITECTURAL
AD	AREA DRAIN
ASPH	ASPHALT
AT	ASPHALT TILE
AUTO	AUTOMATIC
AWN	AWNING
BSMT	BASEMENT
BL	BASE LINE
BM	BEAM
BRG	BEARING
BPL	BEARING PLATE
BEL	BELOW
BM	BENCH MARK
BET	BETWEEN
BVL	BEVELED
BEY	BEYOND
BLK	BLOCK
BLKG	BLOCKING
BD	BOARD
BS	BOTH SIDES
BOT	BOTTOM
BRKT	BRACKET
BRS	BRASS
BRK	BRICK
BRZ	BRONZE
BLDG	BUILDING
BUR	BUILT UP ROOFING
BRGL	BULLET RESISTANT GLASS
BO	BY OWNER
CAB	CABINET
CAN	CANVAS
CPT	CARPET
CSMT	CASEMENT
CI	CAST IRON
CST	CAST STONE
CB	CATCH BASIN
CLG	CEILING
CHT	CEILING HEIGHT
CEM	CEMENT
CM	CENTIMETER (S)
CER	CERAMIC
CT	CERAMIC TILE
CHBD	CHALKBOARD
CHAM	CHAMFER
CHIM	CHIMNEY
CR	CHROMIUM
CIR	CIRCLE
CIRC	CIRCUMFERENCE
CLR	CLEAR, CLEARANCE
CLS	CLOSURE
CGL	COATED GLASS
COL	COLUMN
COMB	COMBINATION
COM	COMMON
COMPT	COMPARTMENT
COMPO	COMPOSITION, COMPOSITE
COMP	COMPRESS, (ED), (ION), (IBLE)
CONC	CONCRETE
CMU	CONCRETE MASONRY UNIT
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUE, CONTINUOUS
CONTR	CONTRACT, CONTRACTOR
CJ	CONTROL JOINT
CPR	COPPER
CG	CORNER GUARD
CORR	CORRUGATED
CTR	COUNTER
CS	COUNTERSINK
CRS	COURSE
CFT	CUBIC FOOT
CYD	CUBIC YARD
DPR	DAMPER
DP	DAMPPROOFING
DL	DEAD LOAD
DEM	DEMOLISH, DEMOLITION
DMT	DEMOUNTABLE
DTL	DETAIL
DIAG	DIAGONAL
DIA	DIAMETER
DIM	DIMENSION
DSP	DISPENSER
DIV	DIVISION
DR	DOOR
DTA	DOVETAIL ANCHOR
DTS	DOVETAIL ANCHOR SLOT
DN	DOWN
DS	DOWNSPOUT
DT	DRAIN TILE
DWR	DRAWER
DWG	DRAWING
DF	DRINKING FOUNTAIN
DW	DUMBWAITER
EA	EACH
EF	EACH FACE
EW	EACH WAY
ESMNT	EASEMENT
E	EAST
	ELASTIC
ELEC	ELECTRIC, (AL)
EP	ELECTRICAL PANELBOARD
EWC	ELECTRIC WATER COOLER
EL	ELEVATION (VERTICAL HEIGHT)
ELE	ELEVATION (VIEW)
ELEV	ELEVATOR
EMER	EMERGENCY
ENC	ENCLOSE, (URE)
EQ	EQUAL
EQP	EQUIPMENT
ESC	ESCALATOR
EST	ESTIMATE
EXH	EXHAUST
EXG	EXISTING
EXMP	EXPANDED METAL PLATE
EB	EXPANSION BOLT
EJT	EXPANSION JOINT
EXP	EXPOSED
EXT	EXTERIOR
FOC	FACE OF CONCRETE
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF STUDS
FAS	FASTEN, FASTENER
FN	FENCE
FBD	FIBERBOARD
FGL	FIBERGLASS
FIN	FINISH, (ED)
FFE	FINISHED FLOOR ELEVATION
FFL	FINISHED FLOOR LINE
FA	FIRE ALARM
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FHS	FIRE HOSE STATION
FPL	FIREPLACE
FP	FIREPROOF
FRT	FIRE-RETARDANT
FLG	FLASHING
FLX	FLEXIBLE
FG	FLOAT GLASS
FLR	FLOOR, (ING)
FD	FLOOR DRAIN
FL	FLOW LINE
FLUR	FLOURESCENT
FJT	FLUSH JOINT
FTG	FOOTING
FND	FOUNDATION
FR	FRAME, (D), (ING)
FS	FULL SIZE
FUR	FURRED, (ING)
FUT	FUTURE
GA	GAGE, GAUGE
GV	GALVANIZED
GKT	GASKET, (ED)
GC	GENERAL CONTRACT, (OR)
GL	GLASS, GLAZING
GLB	GLASS BLOCK
GCMU	GLAZED CONCRETE MASONRY UNITS
GLAM	GLUED LAMINATE
GB	GRAB BAR
GD	GRADE, GRADING
GRN	GRANITE
GRT	GRATE, (ING)
GVL	GRAVEL
GRHS	GREENHOUSE
GT	GROUT
GRD	GUARD
GUT	GUTTER
GPDW	GYPSUM DRY WALL
GPL	GYPSUM LATH
GPPL	GYPSUM PLASTER
GPT	GYPSUM TILE
GPW	GYPSUM WALLBOARD
HC	HANDICAP
HRL	HANDRAIL
HBD	HARDBOARD
HDW	HARDWARE
HWD	HARDWOOD
HDR	HEADER
HTG	HEATING
HVAC	HEATING/VENTILATING/AIR CONDITIONING
HD	HEAVY DUTY
HT	HEIGHT
HPT	HIGH POINT
HCR	HOLLOW CORE
HOR	HORIZONTAL
HB	HOSE BIBB
INCAN	INCANDESCENT
INCIN	INCINERATOR
INCL	INCLUDE, (ED), (ING)
ID	INSIDE DIAMETER
INS	INSULATE, (ED), (ING)
INSC	INSULATING CONCRETE
IGL	INSULATING GLASS
INT	INTERIOR
INTM	INTERMEDIATE
INV	INVERT
JC	JANITOR'S CLOSET
JT	JOINT
JF	JOINT FILLER
J	JOIST
KPL	KICKPLATE
KIT	KITCHEN
KO	KNOCKOUT
LBL	LABEL
LAB	LABORATORY
LAD	LADDER
LB	LAG BOLT
LAM	LAMINATE, (ED)
LGL	LAMINATED GLASS
LAV	LAVATORY
LO	LAYOUT
LH	LEFT HAND
L	LENGTH
LT	LIGHT
LW	LIGHTWEIGHT
LMS	LIMESTONE
LTL	LINTEL
LL	LIVE LOAD
LOC	LOCATE
LLD	LOOSE LAID
LVR	LOUVER
LPT	LOW POINT
MB	MACHINE BOLT
MH	MANHOLE
MFR	MANUFACTURE, (ER)
MRB	MARBLE
MAS	MASONRY
MTL	MATERIAL
MAX	MAXIMUM
MECH	MECHANIC, (AL)
MC	MEDICINE CABINET
MED	MEDIUM
MDO	MEDIUM DENSITY OVERLAY
MBR	MEMBER
MMB	MEMBRANE
MET	METAL
MO	MASONRY OPENING
MW	MICROWAVE
MM	MILLIMETER, (S)
MIN	MINIMUM
MIR	MIRROR
MGL	MIRROR GLASS (FRAMED)
MISC	MISCELLANEOUS
MOD	MODULAR
MLD	MOLDING, MOULDING
MR	MOP RECEPTOR
MT	MOUNT, (ED), (ING)
MOV	MOVABLE
MULL	MULLION
NL	NAILABLE
NAT	NATURAL
NI	NICKEL
NR	NOISE REDUCTION
NOM	NOMINAL
N	NORTH
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NO	NUMBER
OC	ON CENTER, (S)
OP	OPAQUE
OPG	OPENING
OPH	OPPOSITE HAND
ORN	ORNAMENTAL
OD	OUTSIDE DIAMETER
OA	OVERALL
OH	OVERHEAD
PNT	PAINT, (ED)
PNL	PANEL, (ING)
PB	PANIC BAR
PTD	PAPER TOWEL DISPENSER
PTR	PAPER TOWEL RECEPTOR
PAR	PARALLEL
PRPT	PARAPET
PK	PARKING
PBD	PARTICLE BOARD
PTN	PARTITION
PV	PAVE, (D), (ING)
PVMT	PAVEMENT
PERF	PERFORATE, (ED)
PER	PERIMETER
PTR	PLANTER
PLTG	PLANTING
PLAS	PLASTER
PLA	PLASTIC
PLAM	PLASTIC LAMINATE
PL	PLATE
PG	PLATE GLASS
PWD	PLYWOOD
PT	POINT
PVC	POLYVINYL CHLORIDE
PE	PORCELAIN ENAMEL
PCPL	PORTLAND CEMENT PLASTER
PD	POUND,(S)
PCF	POUNDS PER CUBIC FOOT
PLF	POUNDS PER LINEAR FOOT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PCC	PRECAST CONCRETE
PFB	PREFABRICATE, (ED)
PFN	PREFINISHED
PRF	PREFORMED
PREM	PREMOULDED
PL	PROPERTY LINE
QT	QUARRY TILE
RBT	RABBET, REBATE
RAD	RADIUS
RFT	RAFTER
RL	RAIL, (ING)
REC	RECESS. (ED)
REF	REFER, (ENCE)
RFL	REFLECT, (ED), (IVE), (OR)
REFR	REFRIGERATOR
REG	REGISTER
REIN	REINFORCE, (ED), (ING)
RECP	REINFORCED CONCRETE PIPE
REM	REMOVE
REQ'D	REQUIRED
RES	RESILIENT
RET	RETURN
RA	RETURN AIR
RVS	REVERSE (SIDE)
REV	REVISE, (S), REVISE, (ED)
RH	RIGHT HAND
ROW	RIGHT OF WAY
R	RISER
RVT	RIVET
R&S	ROD AND SHELF
RD	ROOF DRAIN
RFH	ROOF HATCH
RFG	ROOFING
RM	ROOM
RO	ROUGH OPENING
RCP	ROUND CONCRETE PIPE
ROK	ROWLOCK
RB	RUBBER BASE
RBT	RUBBER TILE
RBL	RUBBLE STONE
SFGL	SAFETY GLASS
SCH	SCHEDULE
SCN	SCREEN
SCUP	SCUPPER
SNT	SEALANT
STG	SEATING
SEC	SECTION
SVYD	SERVICE YARD
SSK	SERVICE SINK
SHTH	SHEATH, (ING)
SHT	SHEET
SG	SHEET GLASS
SH	SHELF, SHELVING
SHNG	SHINGLE, (S)
SHU	SHUTTER, (S)
SIDG	SIDING
SIM	SIMILAR
SKL	SKYLIGHT
SL	SLEEVE
SLO	SLOPE
SOL	SOLDIER
SC	SOLID CORE
SP	SOUNDPROOF
S	SOUTH
SPC	SPACE, (R)
SGL	SPANDREL GLASS
SPK	SPEAKER
SPL	SPECIAL
SPEC	SPECIFICATION
SPH	SPLASH
SQ	SQUARE
SST	STAINLESS STEEL
STGL	STAINED GLASS
STD	STANDARD
STA	STATION
ST	STEEL
STO	STORAGE
SF	STOREFRONT
SD	STORM DRAIN
STR	STRUCTURAL
STCO	STUCCO
SFLR	SUBFLOOR
SA	SUPPLY AIR
SUS	SUSPENDED
SYD	SIDE YARD
SYM	SYMMETRY, (ETRICAL)
SYN	SYNTHETIC
SYS	SYSTEM
TKBD	TACKBOARD
TEL	TELEPHONE
TV	TELEVISION
TG	TEMPERED GLASS
TIG	TEMPERED, INSULATED GLASS
TZ	TERRAZZO
THK	THICK, (NESS)
THR	THRESHOLD
TBRL	TO BE RELOCATED
TOBR	TO BE REMOVED
TPD	TOILET PAPER DISPENSER
TPTN	TOILET PARTITION
TOL	TOLERANCE
T&G	TONGUE AND GROOVE
TSL	TOP OF CONCRETE SLAB
TC	TOP OF CURB
TJ	TOP OF JOIST
TP	TOP OF PLATE
TST	TOP OF STEEL
TSF	TOP OF SUBFLOOR
TW	TOP OF WALL
TPG	TOPPING
TOR	TO REMAIN
TB	TOWEL BAR
TR	TRANSOM
T	TREAD
TRNB	TURNBUCKLE
TYP	TYPICAL
UC	UNDERCUT
UNF	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
UTL	UTILITY
VJ	V-JOINT
VB	VAPOR BARRIER
VAR	VARNISH
VNR	VENEER
VERT	VERTICAL
VG	VERTICAL GRAIN
VIN	VINYL
VB	VINYL BASE
VCT	VINYL COMPOSITION TILE
VF	VINYL FABRIC
VT	VINYL TILE
VICP	VITREOUS CLAY PIPE
VICT	VITREOUS CLAY TILE
WSCT	WAINSCOT
WH	WALL HUNG
WC	WATER CLOSET
WHTR	WATER HEATER
WP	WATERPROOFING
WR	WATER RESISTANT
WS	WATERSTOP
WST	WEATHERSTRIP, (ING)
WWF	WELDED WIRE FABRIC
W	WEST
WHS	WHEEL STOP
WID	WIDTH, WIDE
WIN	WINDOW
WG	WIRED GLASS
WM	WIRE MESH
WO	WITHOUT
WD	WOOD

SYMBOLS

NOTE: REFER TO ENGINEER DRAWINGS FOR ENGINEERING SYMBOL LISTS

MATERIAL DESIGNATIONS

- EARTH
- POROUS FILL (STONE OR GRAVEL, SUB BASE, ETC.)
- ROCK
- STRUCTURAL CONCRETE (CAST IN PLACE, OR PRECAST)
- BRICK (COMMON OR FACE)
- CONCRETE MASONRY UNITS (CMU)
- CUT STONE, CAST STONE
- MARBLE
- METAL (LARGE SCALE)
- METAL (SMALL SCALE STRUCTURAL & SHEET)
- PLYWOOD (LARGE SCALE)
- WOOD FINISH
- WOOD ROUGH (CONTINUOUS)
- WOOD ROUGH (BLOCKING)
- INSULATION (LOOSE OR BATT)
- INSULATION (RIGID)
- GLASS (LARGE SCALE)
- ACOUSTICAL TILE
- EIFS SYSTEM
- GYPSUM WALL BOARD (REFER TO WALL SECTIONS)
- GYPSUM DRYWALL SYSTEM PARTITION OR WALL
- PLASTER, SAND, CEMENT, GROUT

GRAPHIC SYMBOLS

- XXXX / XXXX — ROOM/SPACE NUMBER
- XXXX — DOOR NUMBER (IF MORE THAN ONE DOOR PER ROOM SUBLETTERS ARE USED)
- XX — WINDOW NUMBER
- INDICATES SECTION NUMBER; SECTION REFERENCE DRAWING NUMBER; INDICATES DRAWING SHEET ON WHICH SECTION IS SHOWN
- INDICATES DETAIL NUMBER; DETAIL REFERENCE DRAWING NUMBER; INDICATES DRAWING SHEET ON WHICH DETAIL IS SHOWN
- INDICATES ELEVATION NUMBER; ELEVATION REFERENCE DRAWING NUMBER; INDICATES DRAWING SHEET ON WHICH ELEVATION IS SHOWN
- A — COLUMN REFERENCE GUIDE
- X — KEY NOTE NUMBER
- 2 — PARTITION TYPE
- FINISH CODE
- INDICATES CHANGE FLOOR FINISH
- ELEVATION TARGET
- FIRE RATED INTERIOR PARTITION - SEE PARTITION TYPES SHEET
- NON-RATED INTERIOR PARTITION - SEE PARTITION TYPES SHEET
- EXTERIOR WALL - SEE WALL SECTIONS

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10/03/2013

Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
	MBJ

Drawing Name:

ABBRIEVIATION & SYMBOLS

Drawing Number:

T-005.00

SHEET5of 102

Initial Date:

REGISTERED ARCHITECT — MATTHEW B. JARMEL — 21AI00794700 — STATE OF NEW YORK

HANDICAP ADAPTABILITY NOTES

1. ALL DETAILS AND GENERAL NOTES PERTAINS TO HANDICAPPED ADAPTABILITY SHALL SUPERSEDE OTHER DETAILS AND NOTES HEREIN.

2. ALL DOORWAYS AND SPACES REQUIRED TO COMPLY WITH HANDICAPPED ADAPTABILITY REQUIRED BY THE SCOPE OF THESE DOCUMENTS SHALL ALSO COMPLY WITH THE REQUIREMENTS OF RS 4-6, THIS INCLUDES (BUT IS NOT LIMITED TO) INTERIOR FINISHES; CONSTRUCTION OF BATHROOM, KITCHEN AND HVAC APPLIANCES AND FOR LIFTS AND ELEVATORS, AND HARDWARE FOR DOORS, WINDOWS AND STORAGE AREAS.

3. DOORWAYS INTENDED FOR USER PASSAGE SHALL HAVE A MINIMUM CLEAR OPENING OF 32 IN. WITH THE DOOR OPEN 90 DEGREES, MEASURED BETWEEN THE FACE OF THE DOOR AND THE STOP.

4. THE DOOR AND BUCK AT THE BATHROOMS SHALL BE DESIGNED AND CONSTRUCTED SO THAT REMOUNTING THE HINGES IS THE ONLY CHANGED REQUIRED TO SWING THE DOOR OUT.

5. THRESHOLDS AT DOORWAYS SHALL NOT EXCEED 3/4 IN. IN HEIGHT FOR EXTERIOR RESIDENTIAL SLIDING DOORS OR 1/2 IN. FOR OTHER TYPES OF DOORS. RAISED THRESHOLDS AND FLOOR LEVEL CHANGES AT ACCESSIBLE DOORWAYS SHALL BE BEVELED WITH A SLOPE NO GREATER THAN 1 : 2.

6. IN DWELLING UNITS THE HEIGHT OF THE WATER CLOSETS SHALL BE AT LEAST 15 IN. AND NO MORE THAN 19 IN. MEASURED TO THE TOP OF THE TOILET SEAT.

7. STRUCTURAL REINFORCEMENT OR OTHER PROVISIONS SHALL BE MADE THAT WILL ALLOW INSTALLATION OF GRAB BARS IN THE LOCATIONS SHOWN IN THE DETAILS.

8. IF A CABINET IS PROVIDED UNDER THE LAVATORY, IT SHALL BE EASILY REMOVABLE FOR A WIDTH OF 30 IN. FINISHED FLOORING SHALL EXTEND UNDER THIS AREA TO THE WALL.

9. THE SINK AND SURROUNDING COUNTER IN ADAPTABLE DWELLING UNITS SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS:
A. THE SINK AND SURFACE: ADJUSTABLE OR REPLACABLE AS A UNIT AT VARIABLE HEIGHTS BETWEEN 28 IN. AND 36 IN. MEASURED FROM THE FINISHED FLOOR TO THE TOP OF THE COUNTER SURFACE OR SINK RIM, OR SHALL BE MOUNTED AT A FIXED HEIGHT NO GREATER THAN 34 IN. MEASURED FROM FINISHED FLOOR TO THE TOP OF THE COUNTER SURFACE OR SINK RIM.
B. WHERE SINKS ARE INSTALLED TO BE ADJUSTABLE IN HEIGHT, ROUGH IN PLUMBING SHALL BE LOCATED TO ACCEPT CONNECTIONS OF SUPPLY AND DRAIN PIPES FOR SINKS MOUNTED AT A HEIGHT OF 28 IN.
C. BASE CABINETS, IF PROVIDED, SHALL BE REMOVABLE UNDER THE FULL 30 IN. MINIMUM FRONTAGE OF THE SINK AND SURROUNDING COUNTER. THE FINISHED FLOORING SHALL EXTEND UNDER THE COUNTER TO THE WALL.
D. COUNTER THICKNESS AND SUPPORTING STRUCTURE SHALL BE 2 IN. MAXIMUM OVER THE REQUIRED CLEAR SPACE.
E. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES UNDER SINKS. HOT WATER PIPES AND DRAIN PIPES UNDER SINKS SHALL BE INSULATED OR OTHERWISE COVERED.

10. OVERHEAD KITCHEN CABINETS (EXCEPT OVER STOVES, COOKTOPS, & PASS THROUGHS) SHALL BE INSTALLED SO AS TO BE EASILY LOWERED TO A HEIGHT OF 48 IN. FROM FINISHED FLOOR TO TOP OF LOWEST SHELF.

11. IF A MEDICINE CABINET IS PROVIDED ABOVE THE LAVATORY, THEN THE BOTTOM OF THE MEDICINE CABINET SHALL BE LOCATED WITH A USABLE SHELF NO HIGHER THAN 44 IN. ABOVE THE FLOOR.

12. AN IN TUB SEAT OR A SEAT AT THE HEAD OF THE TUB SHALL BE PROVIDED IN BATHTUBS. SEATS SHALL BE MOUNTED SECURELY AND SHALL NOT SLIP DURING USE.

13. A SEAT SHALL BE PROVIDED IN SHOWER STALLS. THE SEAT SHALL BE MOUNTED 17 IN. TO 19 IN. FROM THE BATHROOM FLOOR AND SHALL EXTEND THE FULL DEPTH OF THE STALL. THE SEAT SHALL BE ON THE WALL OPPOSITE THE CONTROLS.

14. A SHOWER SPRAY UNIT SHALL BE PROVIDED WITH A HOSE AT LEAST 60 IN. LONG THAT CAN BE USED AS A FIXED SHOWER HEAD OR AS A HAND HELD SHOWER. IF AN ADJUSTABLE HEIGHT SHOWER HEAD MOUNTED ON A VERTICAL BAR IS USED. THE BAR SHALL BE INSTALLED SO AS NOT TO OBSTRUCT THE USE OF GRAB BARS.

15. THE 30 IN. KITCHEN WORK SURFACE SHOWN ON THE PLANS SHALL PROVIDE A WORK SURFACE THAT COMPLIES WITH THE FOLLOWING REQUIREMENTS:
A. THE COUNTER SHALL BE ADJUSTABLE OR REPLACEABLE AS A UNIT AS VARIABLE HEIGHTS BETWEEN 28 IN. AND 36 IN. MEASURED FROM THE FLOOR TO THE TOP COUNTER SURFACE, OR SHALL BE MOUNTED AT A FIXED HEIGHT NO GREATER THAN 34 IN. MEASURED FROM THE FLOOR TO THE TOP COUNTER SURFACE.
B. BASE CABINETS IF PROVIDED, SHALL BE REMOVABLE UNDER THE FULL 30 IN. MINIMUM FRONTAGE OF THE COUNTER. THE FINISHED FLOOR SHALL EXTEND UNDER THE COUNTER TO THE WALL.
C. COUNTER THICKNESS AND SUPPORTING STRUCTURE SHALL BE 2 IN. MAXIMUM OVER THE REQUIRED CLEAR AREA.
D. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES UNDER SUCH COUNTERS.

16. CLOTHES RODS SHALL BE A MAXIMUM OF 54 IN. FROM THE FLOOR.

17. CHANGES IN GROUND LEVEL UP TO 1/4 IN. MAY BE VERTICAL AND WITHOUT EDGE TREATMENT. CHANGES IN LEVEL BETWEEN 1/4 IN. AND 1/2 IN. SHALL BE BEVELED WITH A SLOPE NO GREATER THAN 1 : 2.

18. DOORS TO HAZARDOUS AREAS SHALL BE MADE IDENTIFIABLE TO THE TOUCH BY A TEXTURED SURFACE ON THE DOOR HANDLE, KNOB, PULL OR OTHER OPERATING HARDWARE. THIS TEXTURED SURFACE MAY BE MADE BY KNURLING OR ROUGHENING OR BY A MATERIAL APPLIED TO THE CONTA SCALE: NTS GAS INCLUDE LOADING PLATFORMS, BOILER ROOMS, ETC.).

19. DETECTABLE WARNING TEXTURES ON WALKING SURFACES AS SHOWN ON PLANS SHALL CONSIST OF EXPOSED AGGREGATE CONCRETE, CUSHIONED SURFACES MADE OF RUBBER OR PLASTIC, RAISED STRIPS, OR GROOVES. TEXTURES SHALL CONTRAST WITH THAT OF THE SURROUNDING SURFACE. RAISED STRIPS OR GROOVES SHALL COMPLY WITH RS 4-6. GROOVES MAY BE USED INDOORS ONLY.

20. AUDIBLE EMERGENCY ALARMS SHALL PRODUCE A SOUND THAT EXCEED THE PREVAILING EQUIVALENT SOUND LEVEL IN THE ROOM OR SPACE BY AT LEAST 15 DECIBELS OR EXCEEDS ANY MAXIMUM SOUND LEVEL WITH A DURATION OF 30 SECONDS BY 5 DECIBELS, WHICHEVER IS LOUDER. SOUND LEVELS FOR ALARM SIGNALS SHALL NOT EXCEED 120 DECIBELS.

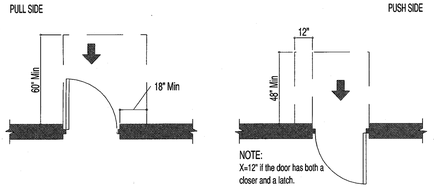
21. THE STRUCTURAL STRENGTH OF GRAB BARS, TUB AND SHOWER SEATS, FASTENERS, AND MOUNTING DEVICES SHALL MEET THE FOLLOWING SPECIFICATIONS:
A. BENDING STRESS IN A GRAB BAR OR SEAT INDUCED BY THE MAXIMUM BENDING MOMENT FROM THE APPLICATION OF 250 LBF SHALL BE LESS THAN THE ALLOWABLE STRESS FOR THE MATERIAL OF THE GRAB BAR OR SEAT IF THE CONNECTION BETWEEN THE GRAB BAR OR SEAT,
B. SHEAR STRESS INDUCED IN A GRAB BAR OR SEAT BY THE APPLICATION OF 250 LBF (1112N) SHALL BE LESS THAN THE ALLOWABLE SHEAR STRESS FOR THE MATERIAL OF THE GRAB BAR OR SEAT IF THE CONNECTION BETWEEN THE GRAB BAR OR SEAT AND ITS MOUNTING BRACKET OR OTHER SUPPORT IS CONSIDERED TO BE FULLY RESTRAINED, THEN DIRECT AND TORSIONAL SHEAR STRESSES SHALL BE TOTALLED FOR FOR THE COMBINED SHEAR STRESS, WHICH SHALL NOT EXCEED THE ALLOWABLE SHEAR STRESS.
C. SHEAR FORCE INDUCED IN A FASTENER OR MOUNTING DEVICE FROM THE APPLICATION OF 250 LBF (1112N) SHALL BE LESS THAN THE ALLOWABLE LATERAL LOAD OF EITHER THE FASTENER OF MOUNTING DEVICE OR THE SUPPORTING STRUCTURE, WHICHEVER IS THE SMALLER ALLOWABLE LOAD.
D. TENSILE FORCE INDUCED IN A FASTENER BY A DIRECT TENSION FORCE OF 250 LBF (1112N) PLUS THE MAXIMUM MOMENT FROM THE APPLICATION OF 250 LBF (1112N) SHALL BE LESS THAN THE ALLOWABLE WITHDRAWAL LOAD BETWEEN THE FASTENER AND THE SUPPORTING STRUCTURE.
E. GRAB BARS SHALL NOT ROTATE WITHIN THEIR FITTINGS.

23. DWELLING UNITS OF 1ST. FLOOR SHALL BE FULLY HANDICAP ADAPTABLE AS PER LOCAL LAW 58, OF 1987. ALL CONSTRUCTION EXPRESSLY INDICATED OR IMPLIED HEREIN, SHALL COMPLY IN FULL TO THE PROVISIONS OF NYC LOCA LAW 58/87, AND THE ACCOMPANYING REFERENCE STANDARD 4-6, FOR HANDICAPPED ADAPTABILITY.

MANEUVERING CLEARANCES AT DOORS

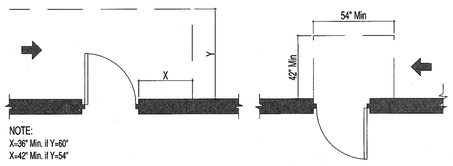
CLEAR DOORWAY WIDTH & DEPTH

FRONT APPROACHES



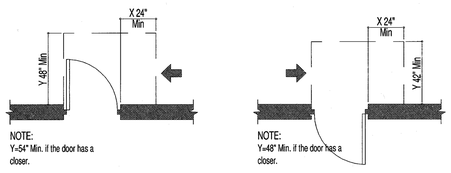
NOTE:
X=12" if the door has both a closer and a latch.

HINGE-SIDE APPROACHES



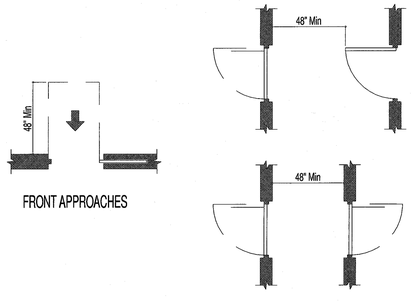
NOTE:
X=36" Min. if Y=60"
X=42" Min. if Y=54"

LATCH-SIDE APPROACHES



NOTE:
Y=54" Min. if the door has a closer.

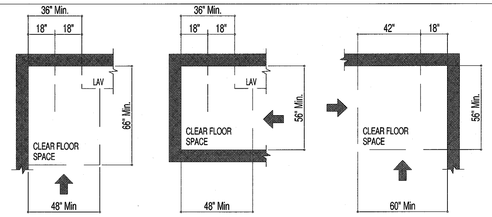
NOTE:
Y=48" Min. if the door has a closer.



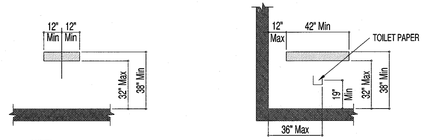
FRONT APPROACHES

TWO HINGED DOORS IN SERIES

CLEAR FLOOR SPACE FOR ADAPTABLE BATHROOMS



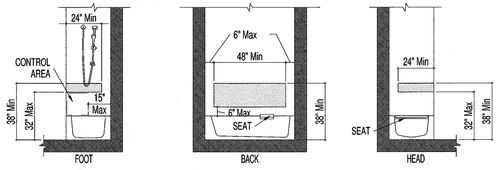
CLEAR FLOOR SPACE FOR ADAPTABLE BATHROOMS



NOTE:
The lightly shaded areas are reinforced to recieve grab bars.

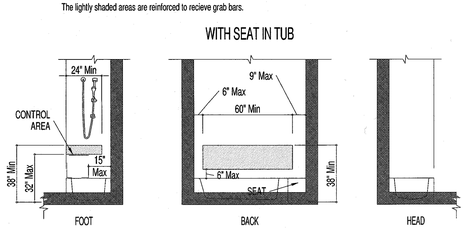
REINFORCED AREAS FOR INSTALLATION OF GRAB BARS

LOCATION OF GRAB-BAR REINFORCEMENTS & CONTROLS OF ADAPTABLE BATHTUBS



NOTE:
The lightly shaded areas are reinforced to recieve grab bars.

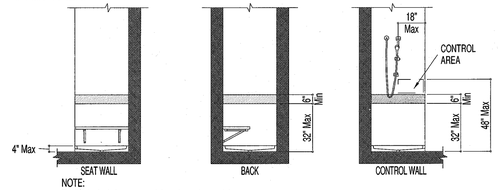
WITH SEAT IN TUB



WITH SEAT AT HEAD OF TUB

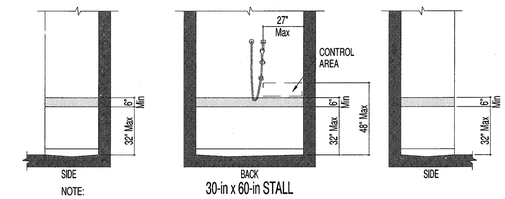
NOTE:
The lightly shaded areas are reinforced to recieve grab bars.

LOCATION OF GRAB-BAR REINFORCEMENTS & CONTROLS OF ADAPTABLE SHOWERS



NOTE:
The lightly shaded areas are reinforced to recieve grab bars.

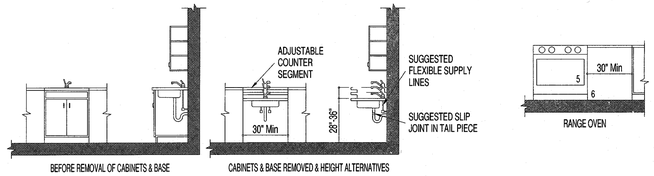
36-in x 36-in STALL



30-in x 60-in STALL

NOTE:
1. The lightly shaded areas are reinforced to recieve grab bars.
2. Shower head & control area may be on back wall (as shown) or on either side.

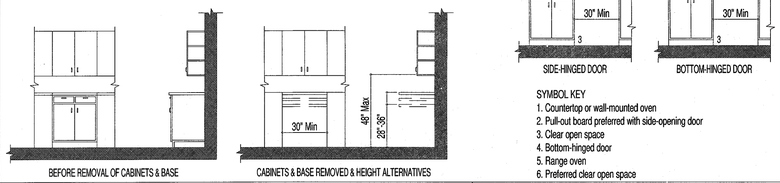
KITCHENETTE



BEFORE REMOVAL OF CABINETS & BASE

CABINETS & BASE REMOVED & HEIGHT ALTERNATIVES

COUNTER WORK SURFACE



BEFORE REMOVAL OF CABINETS & BASE

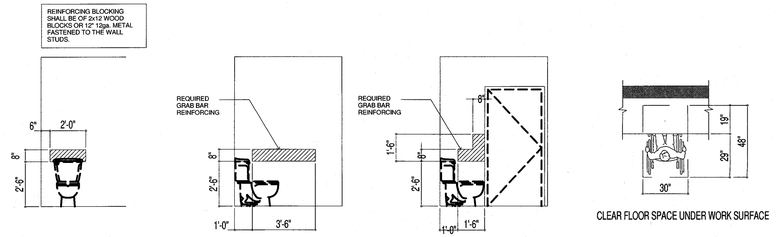
CABINETS & BASE REMOVED & HEIGHT ALTERNATIVES

SIDE-HINGED DOOR

BOTTOM-HINGED DOOR

SYMBOL KEY
1. Countertop or wall-mounted oven
2. Pull-out board preferred with side-opening door
3. Clear open space
4. Bottom-hinged door
5. Range oven
6. Preferred clear open space

OVENS WITHOUT SELF-CLEANING FEATURE

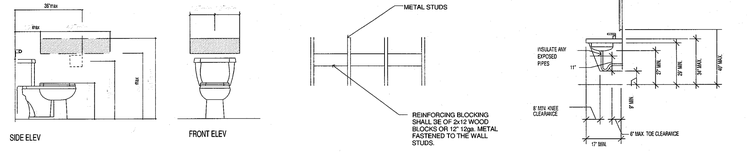


TOILET BACK WALL

TOILET SIDE WALL

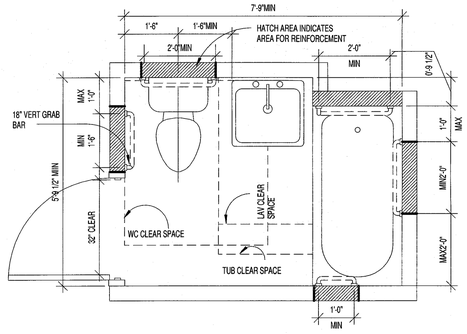
TOILET SIDE WALL W/ DOOR

CLEAR FLOOR SPACE UNDER WORK SURFACE



LAVATORY CLEARANCES

LOCATION OF GRAB-BAR AT TOILET



TYPE B UNIT TOILET & BATHING FACILITY

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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. "GA-27817"

10/03/2013

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	MBJ

Drawing Name:
HANDICAP / ADAPTABLE CLEARANCES

Drawing Number:
T-006.00

SHEET6of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL LIC. NO. 24673 STATE OF NEW YORK

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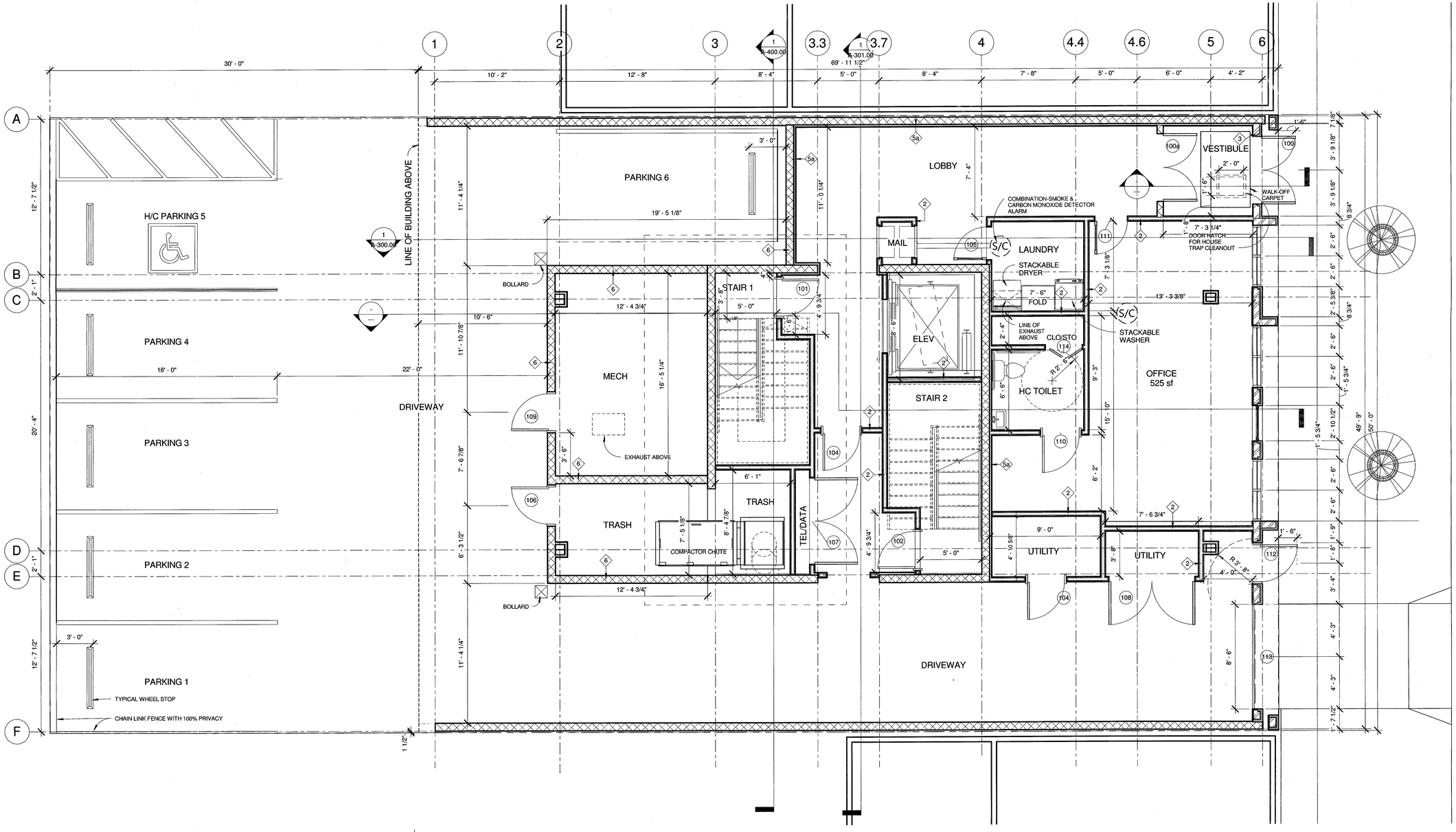

1 1st FLOOR PLAN

SCALE : 1/4" = 1'-0"

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	FL LIC 70134	NY	LIC 075898-1
	MI LIC 6201052339	PA	LIC PE070000
	DE LIC 18754	MA	LIC 50445
	VT LIC 88498		

ASSOCIATES:

RONALD A. BROKENSHIRE, PE	NJ LIC GE45511
DAVID L. LESESNE, RA	NJ LIC GE45511 NY LIC 024719
MICHAEL J. VORLAND, RA	NY LIC 036993
GERARD P. GESARIO, PE	NY LIC GE038255
JOHN TUDOR, RA	NY LIC 023617 NJ LIC 21A8012660
FREDRICK KINCAID, RA	NJ LIC 21A8018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA-278177

10/03/2013

Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:** MBJ

Drawing Name:

1ST FLOOR

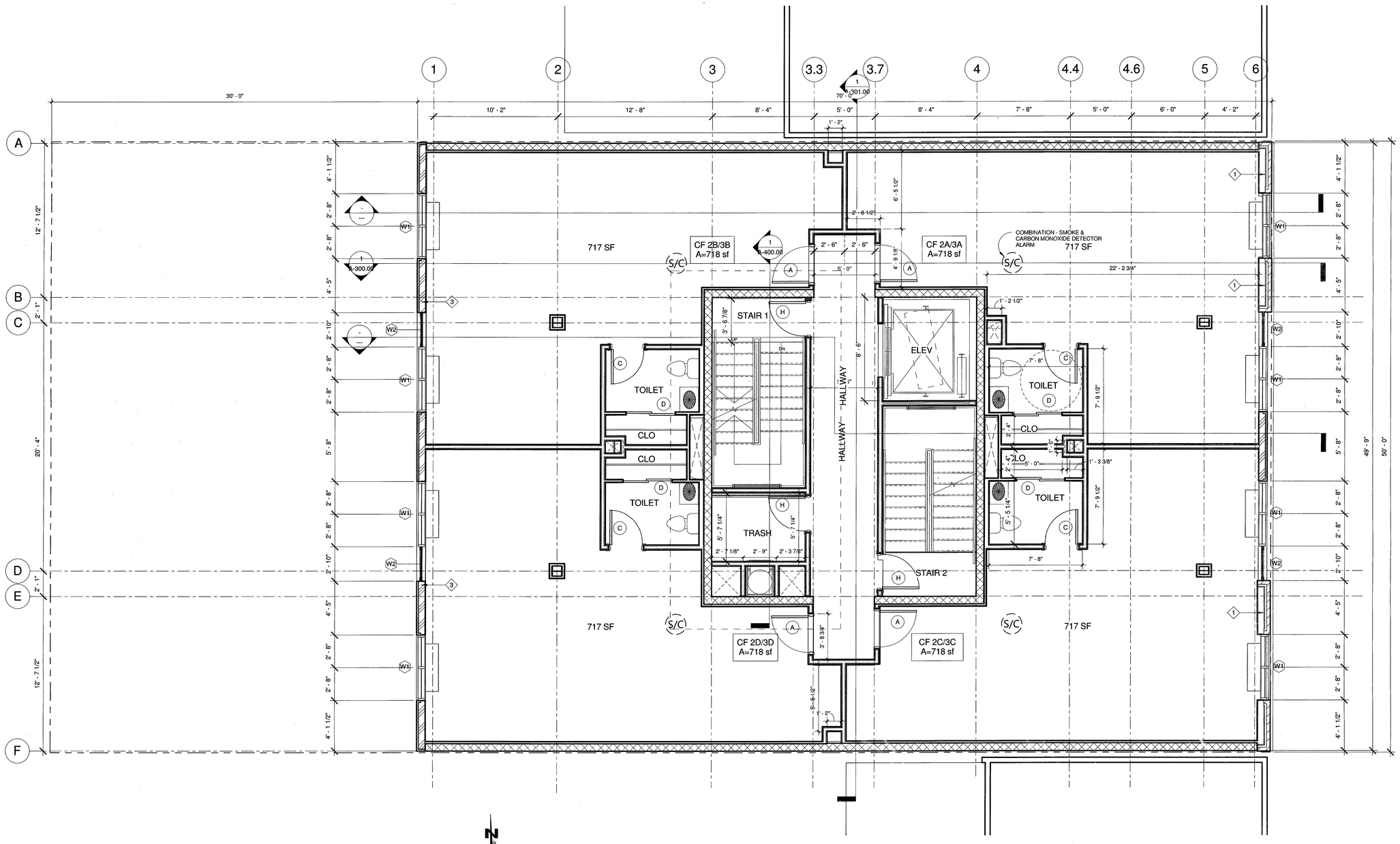
Drawing Number:

A101.00

SHEET23of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
NO. 048473
STATE OF NEW YORK



1 TYPICAL 2nd & 3rd FLOOR PLAN

SCALE : 1/4" = 1'-0"

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DC LIC ARC-101849 — MN LIC 46404
DE LIC S5-00007256 — NC LIC 10120
FL LIC AR94034 — NH LIC 3501
GA LIC RA011484 — NY LIC 024673
IA LIC 05577 — OH LIC A-99-12444
IL LIC 001.020069 — PA LIC RA-014851-B
MA LIC AR10286 — TN LIC 103450
MD LIC 12662 — TX LIC 20992
VA LIC 0401 014089
VT LIC 2453

IRWIN H. KIZEL, AIA, PP
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NJ PP LIC 33LI00243100

RICHARD A. JARMEL, PE
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FL LIC 70134 — MN LIC 47482
MI LIC 6201052339 — NY LIC 0738898-1
DE LIC 18754 — PA LIC PE070600
VT LIC 88498 — MA LIC 50445

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GERARD P. GESARIO, PE — NY LIC GE038255
JOHN TUDOR, RA — NY LIC 023617, NJ LIC 21AI012060
FREDRICK KINCAID, RA — NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. "GA 27811" 10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

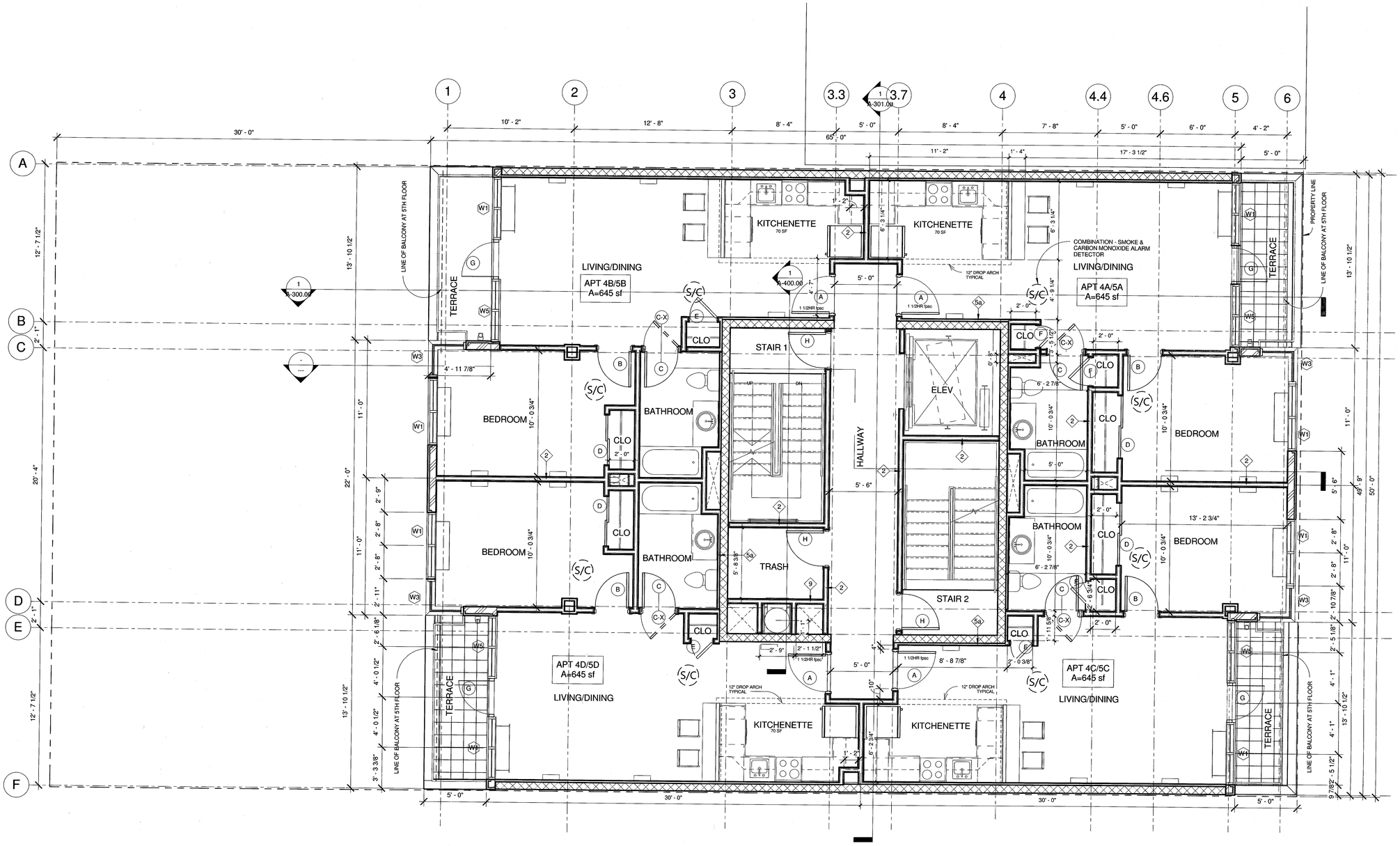
Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	Approved By: MBJ

Drawing Name:
TYPICAL 2ND & 3RD FLOOR PLAN

Drawing Number:
A102.00

SHEET24of 102
Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
No. 024673
STATE OF NEW YORK



1 TYPICAL 4th & 5th FLOOR PLAN

SCALE : 1/4" = 1'-0"

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GA LIC RA011484 — NY LIC 024673
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FL LIC 70134 — NY LIC 0738898-1
MI LIC 6201052339 — PA LIC PE070600
DE LIC 18754 — MA LIC 50465
VT LIC 88498
ASSOCIATES:
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FREDRICK KINCAID, RA — NJ LIC 21AI018294
NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA-378177

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
	MBJ

Drawing Name:
TYPICAL 4TH & 5TH FLOOR PLAN

Drawing Number:
A103.00

SHEET25of 102

Initial Date:

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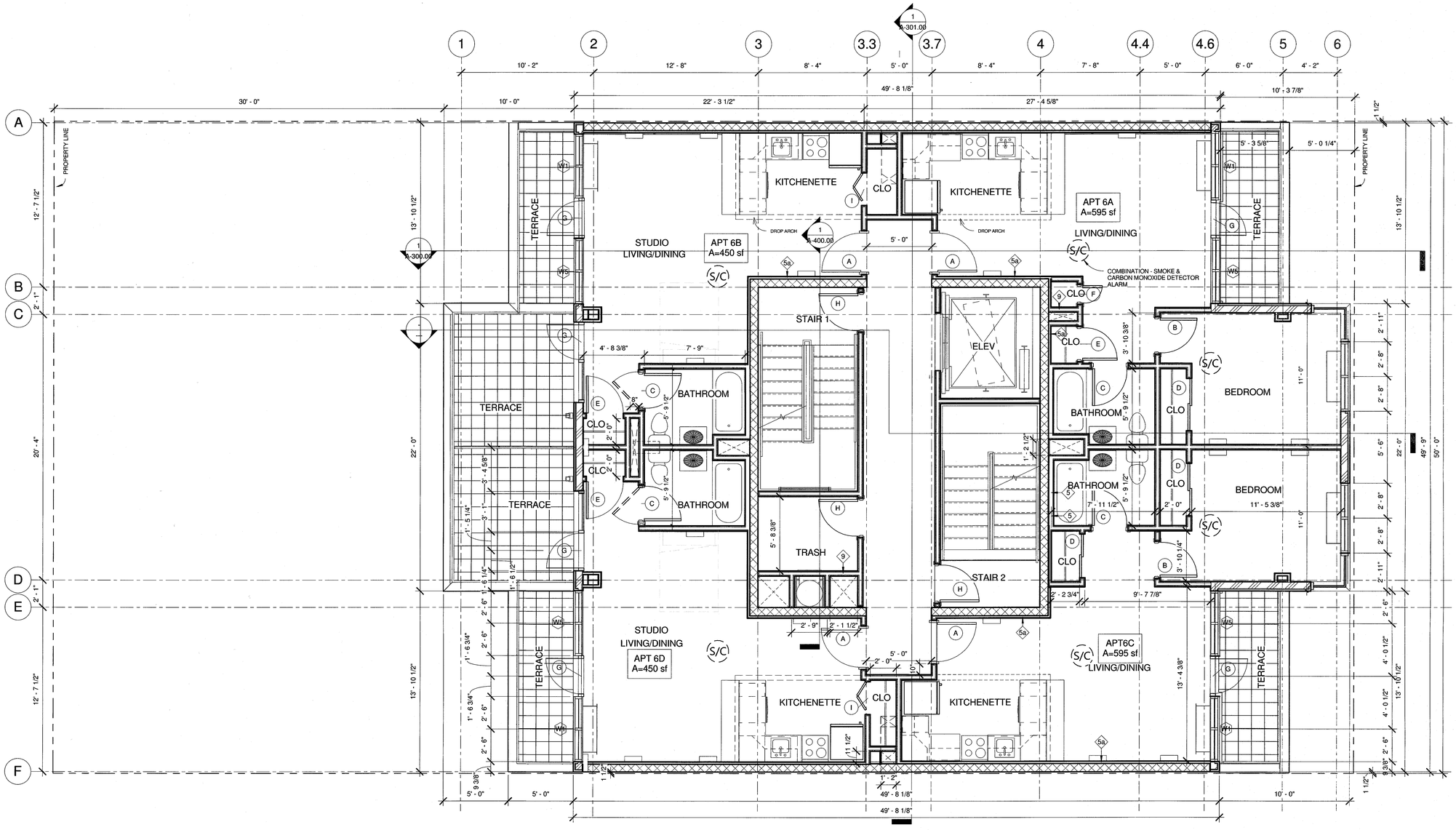

1 6th FLOOR PLAN

SCALE : 1/4" = 1'-0"

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MI LIC 6201032339 — PA LIC PE070600
DE LIC 18754 — MA LIC 50445
VT LIC 88498

ASSOCIATES:

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FREDRICK KINCAID, RA — NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 16I
NJ State Board of Engineers & Land Surveyors Authorization No. GA-21817
10/03/2013

Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
	MBJ

Drawing Name:

6TH FLR

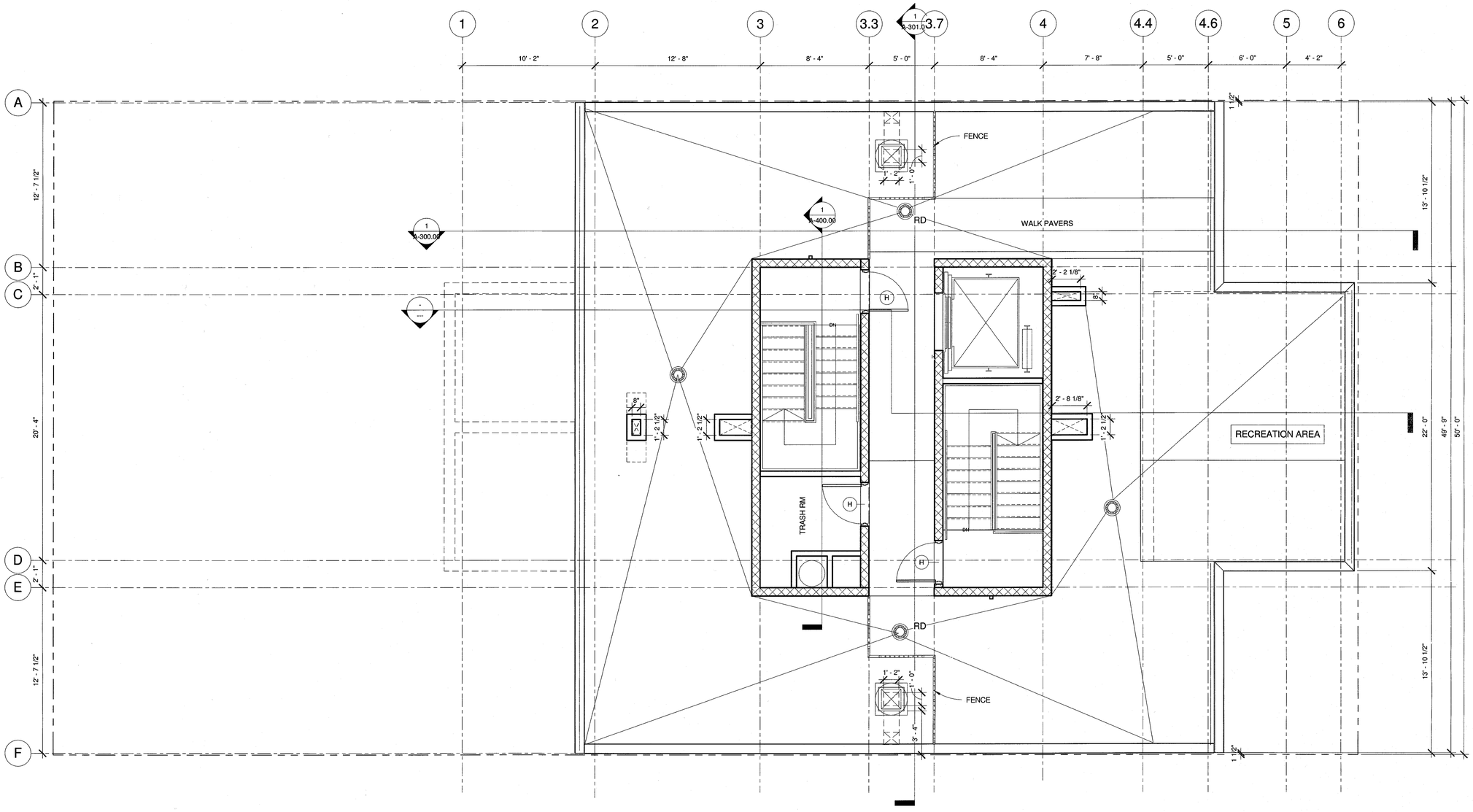
Drawing Number:

A104.00

SHEET26of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL No. 38472 STATE OF NEW YORK



1 ROOF PLAN

SCALE : 1/4" = 1'-0"

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DE LIC 18754 — PA LIC PE070600
VT LIC 88498 — MA LIC 50445

ASSOCIATES:

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DAVID L. LESESNE, RA — NJ LIC GE45511 / NY LIC 024719
MICHAEL J. VORLAND, RA — NY LIC 036993
GERARD P. GESARIO, PE — NY LIC GE038255
JOHN TUDOR, RA — NY LIC 023617 / NJ LIC 21AI012660
FREDRICK KINCAID, RA — NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. CA 27811
10/03/2013

Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
	MBJ

Drawing Name:

ROOF

Drawing Number:

A105.00

SHEET27of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
No. 37491
STATE OF NEW YORK

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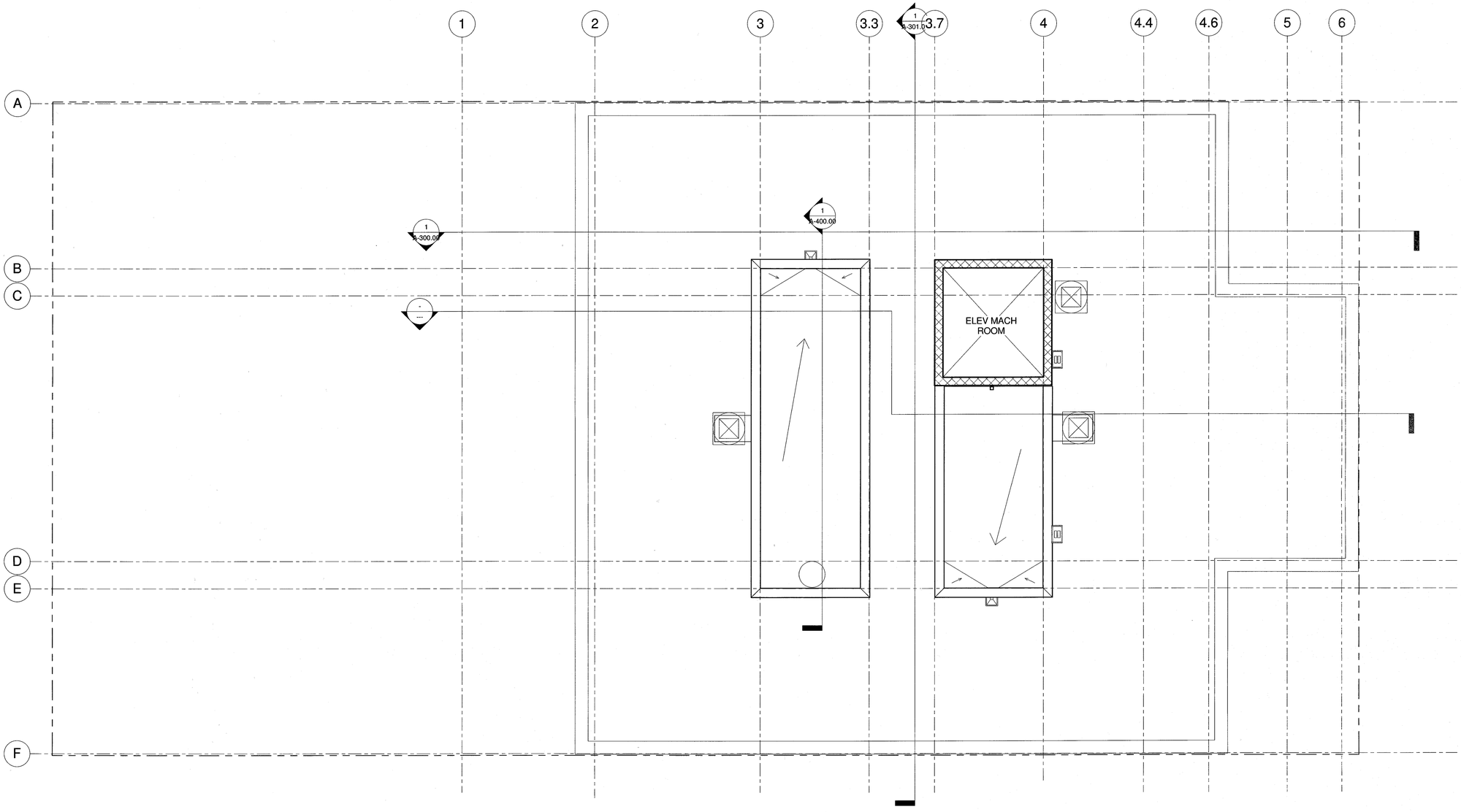

1 BULKHEAD PLAN

SCALE : 1/4" = 1'-0"

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DC LIC ARC-101849 — MN LIC 46404
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NJ LIC PP LIC 33LB00243100

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MI LIC 6201052339 — PA LIC PE070600
DE LIC 18754 — MA LIC 50445
VT LIC 88498

ASSOCIATES:
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GERARD P. GESARIO, PE — NY LIC GE038255
JOHN TUDOR, RA — NY LIC 023617, NJ LIC 21AI012660
FREDRICK KINCAID, RA — NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. "GA-27811"

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:** MBJ

Drawing Name:
BULKHEAD PLAN

Drawing Number:
A-106.00

SHEET28of 102

Initial Date:

REGISTERED ARCHITECT — MATTHEW B. JARMEL — NO. 024073 — STATE OF NEW YORK

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LEGEND:

EXPOSED CONCRETE (PLANAR) SURFACE - PAINTED PAINTED
9'-10" at 1st & 2nd Floors
9'-10" all other floors N.O.

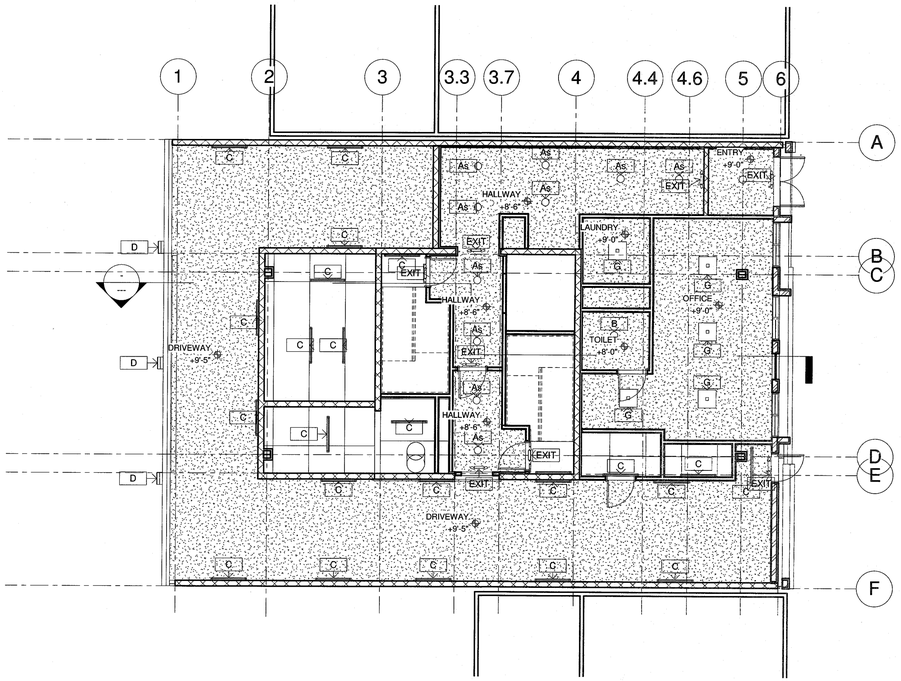
GYPSUM BOARD SOFFIT
8'-6" A.F.F. U.N.O.

GENERAL NOTES:

1. ALL LIGHT FIXTURES IN ROOMS TO BE CENTERED UNLESS OTHERWISE NOTED.
2. SEE FIRE ALARM DRAWINGS FOR DEVICE LOCATION.
3. CONTRACTOR SHALL ADJUST CEILING GRIDS TO CENTER THEM TO ROOMS & CREATE EQUAL TILE SPACING AT WALLS.
4. REFER TO MECHANICAL & ELECTRICAL DRAWINGS FOR EQUIPMENT. FIXTURES & DEVICES DIFFUSERS.
5. SEE FINISH SCHEDULE FOR CEILING & SOFFIT PAINT COLORS.
5. LOCATIONS NOT DIMENSIONED OR POSITIONED SCHEMATICALLY. CONTRACTOR TO COORDINATE FINAL LOCATIONS OF ALL CEILING ITEMS DISCREPANCIES OR CONFLICTS SHALL BE REPORTED TO ARCHITECT.

LED LIGHTING FIXTURE SCHEDULE

FIXTURE SYMBOL	TYPE	DESCRIPTION	MANUFS OR EQUIV	MODEL#
	D	1'x4' 3 LAMP WALL PACKS - WALL MOUNTED	LITHONIA LIGHTING	WST
	G	13"x13" LAMP SURFACE SEMI-FLUSH MOUNT	TECH LIGHTING	700TDCHAFM
AL	A(L)	11" LED DOWNLIGHT - KITCHEN (APARTMENT) CEILING MOUNT	TECH LIGHTING	700CQ
As	A(s)	6" LED DOWNLIGHT - CORRIDOR CEILING RECESSED	TECH LIGHTING	700CQ
	B	6" LED DOWNLIGHT - WET LOCATION RATED RECESSED	LITHONIA LIGHTING	LDN6 SERIES
	F	EXTERIOR WALL MOUNTED WALL SCONCE (3'-0" AFF)	RAB LIGHTING	SLED5NW
	C	4'-0" LED LINEAR LIGHT - WALL OR CEILING MOUNTED	LITHONIA LIGHTING	WL4
	EXIT	WALL MOUNTED EMERGENCY .LED LIGHT WITH BATTERY BACKUP	LITHONIA LIGHTING	ELM2 LED
		LED BATHROOM VANITY WALL MOUNTED ABOVE MIRROR-CENTERED		



1 1ST FLOOR RCP

SCALE : 1/8" = 1'-0"

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FREDRICK KINCAID, RA — NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA-278177
10/03/2013

Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	Approved By: MBJ

Drawing Name:

1ST FLR FINISH & RCP PLAN

Drawing Number:

A-110.00

SHEET29of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
No. 026870
STATE OF NEW YORK

LEGEND:

EXPOSED CONCRETE PLANK SURFACE - PAINTED
9'-10" at 1st & 2nd Floors
9'-10" all other floors. N.O.

GYPSUM BOARD SOFFIT
8'-6" A.F.F. U.N.O.

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FIXTURE SYMBOL	FIXTURE TYPE	DESCRIPTION	MANUF'S OR EQUIV	MODEL#
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	B	6" LED DOWNLIGHT - WET LOCATION RATED RECESSED	LITHONIA LIGHTING	LDN6 SERIES
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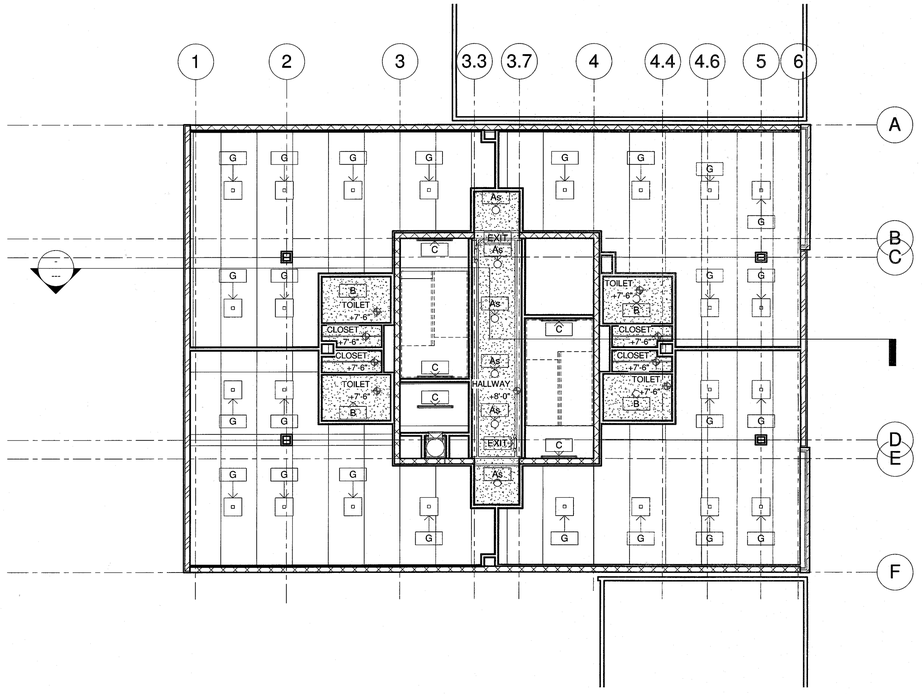
	C	4'-0" LED LINEAR LIGHT - WALL OR CEILING MOUNTED	LITHONIA LIGHTING	WL4
	EXIT	WALL MOUNTED EMERGENCY .LED LIGHT WITH BATTERY BACKUP	LITHONIA LIGHTING	ELM2 LED
		LED BATHROOM VANITY WALL MOUNTED ABOVE MIRROR-CENTERED		



1 TYP 2ND & 3RD FLOOR RCP

SCALE : 1/8" = 1'-0"

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CT LIC PEN0027735 — MN LIC 47482
FL LIC 70134 — NY LIC 0733899E-1
MI LIC 6201052339 — PA LIC PE070680
DE LIC 18754 — MA LIC 50445
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ASSOCIATES:
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JOHN TUDOR, RA — NY LIC 023617, NJ LIC 21AI012660
FREDRICK KINCAID, RA — NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. "VA-27817"

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	Approved By: MBJ

Drawing Name:
TYP 2ND-3RD FLR FINISH & RCP

Drawing Number:
A-111.00

SHEET30of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
No. 024673
STATE OF NEW YORK

3/20/2015 2:05:54 PM
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LEGEND:

EXPOSED CONCRETE (FLAT) SURFACE - PAINTED
9'-10" at 1st & 2nd Floors
9'-10" all other floors U.N.O.

GYPSUM BOARD SOFFIT
8'-6" A.F.F. U.N.O.

GENERAL NOTES:

1. ALL LIGHT FIXTURES IN ROOMS TO BE CENTERED UNLESS OTHERWISE NOTED.
2. SEE FIRE ALARM DRAWINGS FOR DEVICE LOCATION.
3. CONTRACTOR SHALL ADJUST CEILING GRIDS TO CENTER THEM TO ROOMS & CREATE EQUAL TILE SPACING AT WALLS.
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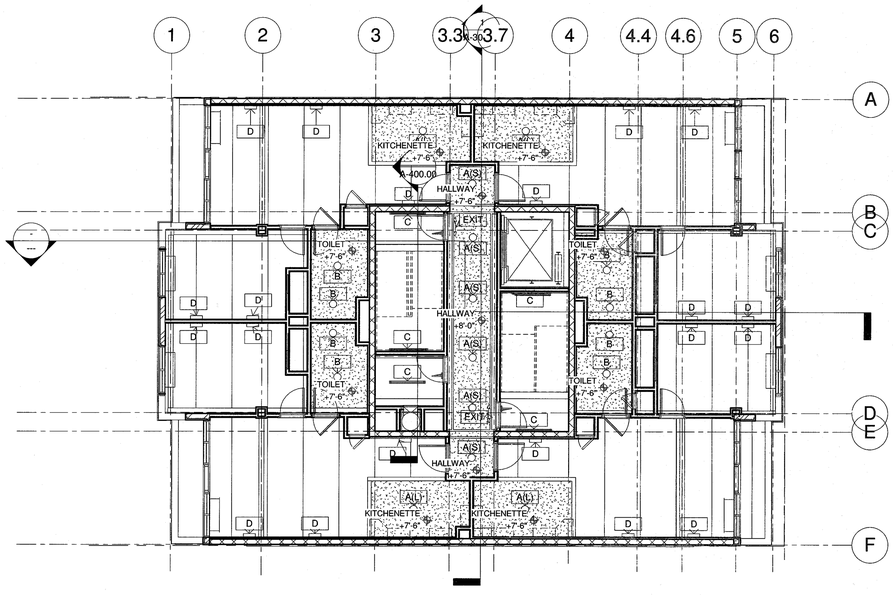
5. SEE FINISH SCHEDULE FOR CEILING & SOFFIT PAINT COLORS.
5. LOCATIONS NOT DIMENSIONED OR POSITIONED SCHEMATICALLY. CONTRACTOR TO COORDINATE FINAL LOCATIONS OF ALL CEILING ITEMS DISCREPANCIES OR CONFLICTS SHALL BE REPORTED TO ARCHITECT.

LED LIGHTING FIXTURE SCHEDULE

FIXTURE SYMBOL	TYPE	DESCRIPTION	MANUF'S OR EQUIV	MODEL#
	D	1'x4' 3 LAMP WALL PACKS - WALL MOUNTED	LITHONIA LIGHTING	WST
	G	13"x13" LAMP SURFACE SEMI-FLUSH MOUNT	TECH LIGHTING	700TDCHAFM
AL	A(L)	11" LED DOWNLIGHT - KITCHEN (APARTMENT) CEILING MOUNT	TECH LIGHTING	700CQ
As	A(s)	6" LED DOWNLIGHT - CORRIDOR CEILING RECESSED	TECH LIGHTING	700CQ
	B	6" LED DOWNLIGHT - WET LOCATION RATED RECESSED	LITHONIA LIGHTING	LDN6 SERIES
	F	EXTERIOR WALL MOUNTED WALL SCONCE (3'-0" AFF)	RAB LIGHTING	SLED5NW
	C	4'-0" LED LINEAR LIGHT - WALL OR CEILING MOUNTED	LITHONIA LIGHTING	WL4
	EXIT	WALL MOUNTED EMERGENCY ,LED LIGHT WITH BATTERY BACKUP	LITHONIA LIGHTING	ELM2 LED
♀		LED BATHROOM VANITY WALL MOUNTED ABOVE MIRROR-CENTERED		



1 TYP 4TH & 5TH FLOOR RCP

SCALE : 1/8" = 1'-0"

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FREDRICK KINCAID, RA — NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA-27817
10/03/2013

Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:** MBJ

Drawing Name:

TYP 4TH-5TH FINISH & RCP PLAN

Drawing Number:

A-112.00

SHEET31of 102

Initial Date:

REGISTERED ARCHITECT — MATTHEW B. JARMEL — No. 24475 — STATE OF NEW YORK

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LEGEND:

EXPOSED CONCRETE (FLOOR SURFACE - PAINTED/PAINTED
9'-10" at 1st & 2nd Floors
9'-10" all other floors. N.O.

GYPSUM BOARD SOFFIT
8'-6" A.F.F. U.N.O.

GENERAL NOTES:

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LED LIGHTING FIXTURE SCHEDULE

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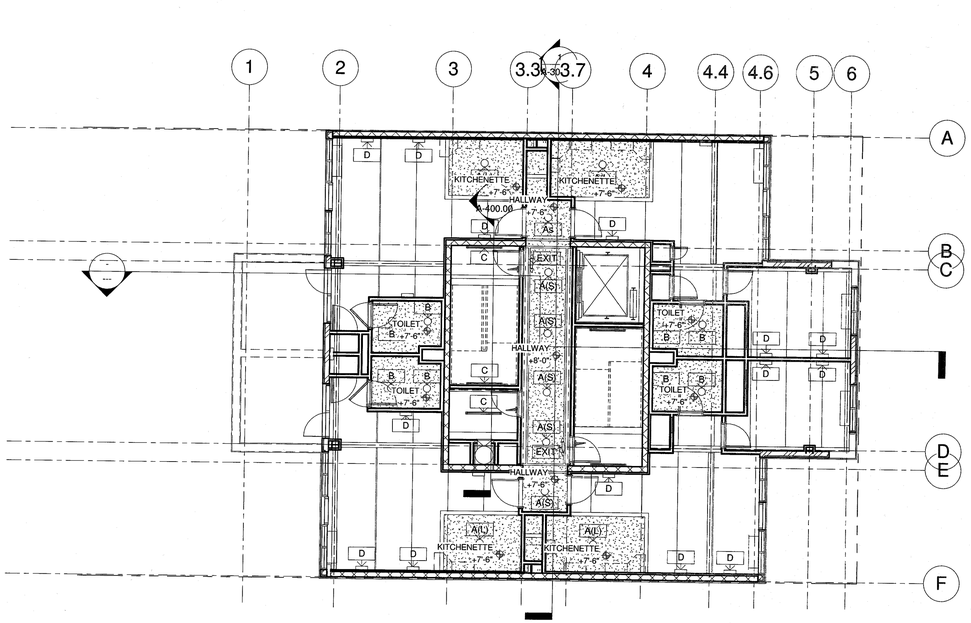
▫	G	13"x13" LAMP SURFACE SEMI-FLUSH MOUNT	TECH LIGHTING	700TDCHAFM
○ AL	A(L)	11" LED DOWNLIGHT - KITCHEN (APARTMENT) CEILING MOUNT	TECH LIGHTING	700CQ
○ As	A(s)	6" LED DOWNLIGHT - CORRIDOR CEILING RECESSED	TECH LIGHTING	700CQ
○	B	6" LED DOWNLIGHT - WET LOCATION RATED RECESSED	LITHONIA LIGHTING	LDN6 SERIES
⊓	F	EXTERIOR WALL MOUNTED WALL SCONCE (3'-0" AFF)	RAB LIGHTING	SLED5NW
▬	C	4'-0" LED LINEAR LIGHT - WALL OR CEILING MOUNTED	LITHONIA LIGHTING	WL4
◁	EXIT	WALL MOUNTED EMERGENCY .LED LIGHT WITH BATTERY BACKUP	LITHONIA LIGHTING	ELM2 LED
♀		LED BATHROOM VANITY WALL MOUNTED ABOVE MIRROR-CENTERED		



1 6TH FLOOR RCP

SCALE : 1/8" = 1'-0"

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FREDRICK KINCAID, RA — NJ LIC 21AI012660 / NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. 24GA-27811700

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:** MBJ

Drawing Name:
6TH FINISH & RCP PLAN

Drawing Number:
A-113.00

SHEET32of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL STATE OF NEW YORK

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LEGEND:

EXPOSED CONCRETE (PLANK) SURFACE - PAINTED PAINTED
9'-10" at 1st & 2nd Floors
9'-10" all other floors N.O.

GYPSUM BOARD SOFFIT
8'-6" A.F.F. U.N.O.

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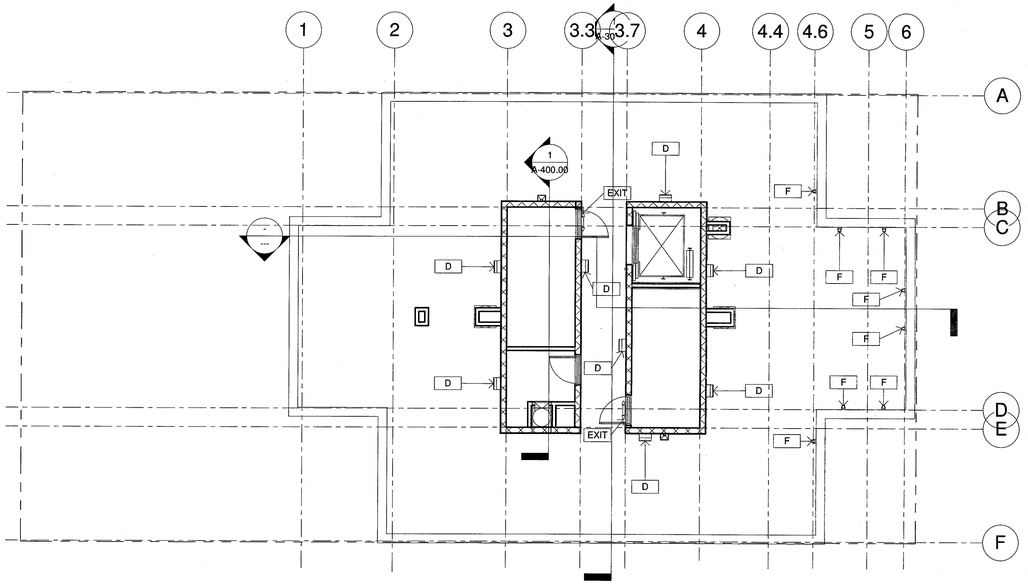
As	A(s)	6" LED DOWNLIGHT - CORRIDOR CEILING RECESSED	TECH LIGHTING	700CQ
	B	6" LED DOWNLIGHT - WET LOCATION RATED RECESSED	LITHONIA LIGHTING	LDN6 SERIES
	F	EXTERIOR WALL MOUNTED WALL SCONCE (3'-0" AFF)	RAB LIGHTING	SLED5NW
	C	4'-0" LED LINEAR LIGHT - WALL OR CEILING MOUNTED	LITHONIA LIGHTING	WL4
	EXIT	WALL MOUNTED EMERGENCY .LED LIGHT WITH BATTERY BACKUP	LITHONIA LIGHTING	ELM2 LED
		LED BATHROOM VANITY WALL MOUNTED ABOVE MIRROR-CENTERED		



1 ROOF LIGHTING PLAN

SCALE : 1/8" = 1'-0"

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MA LIC AR10286 — TN LIC 103850
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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. 24A-27817

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:** MBJ

Drawing Name:
RCP ROOF

Drawing Number:
A-114.00

SHEET33of 102

Initial Date:

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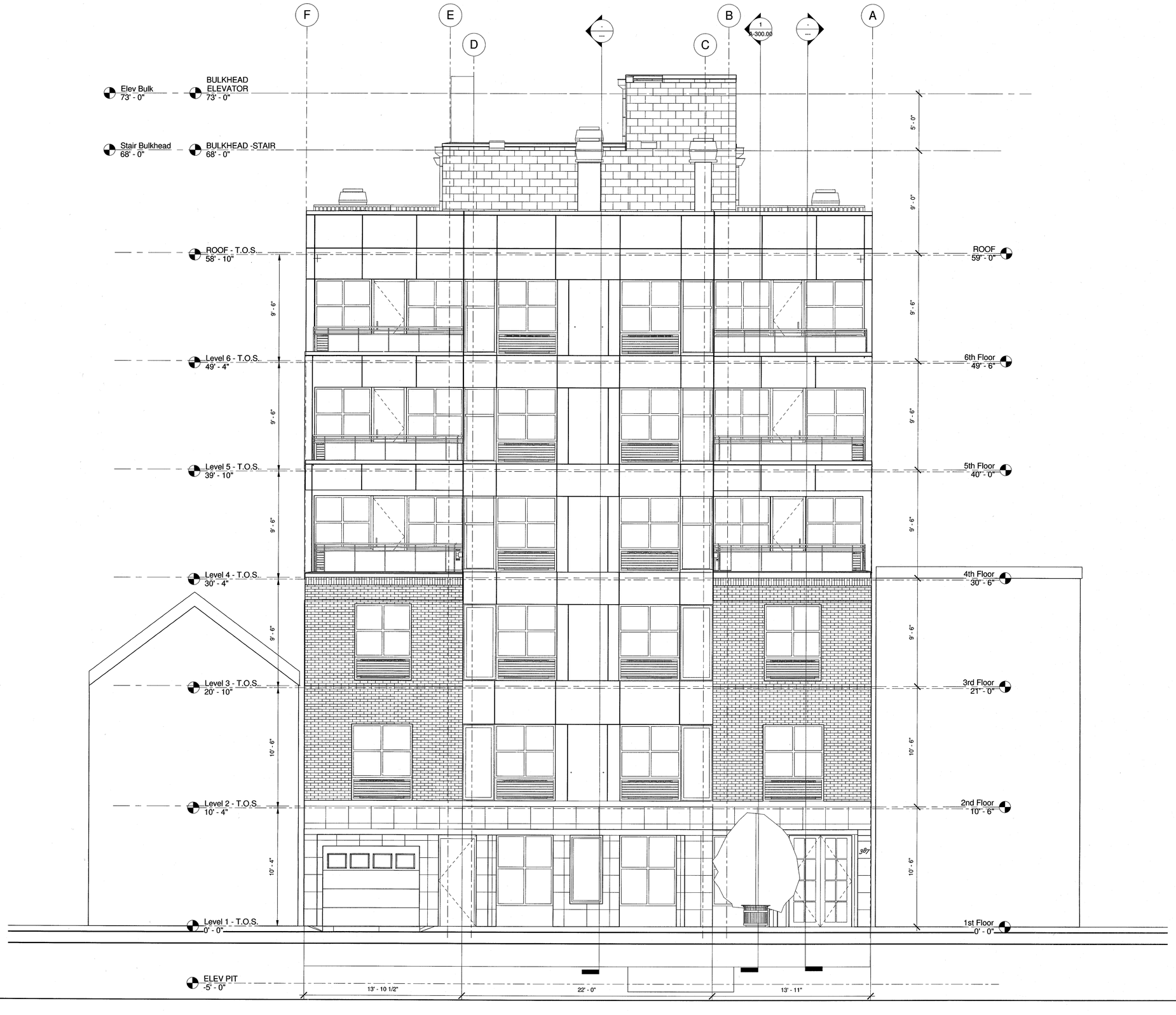

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NJ State Board of Engineers & Land Surveyors Authorization No. GA-27817
10/03/2013

Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:** MBJ

Drawing Name:

EAST ELEV

Drawing Number:

A-200.00

SHEET34of 102

Initial Date:

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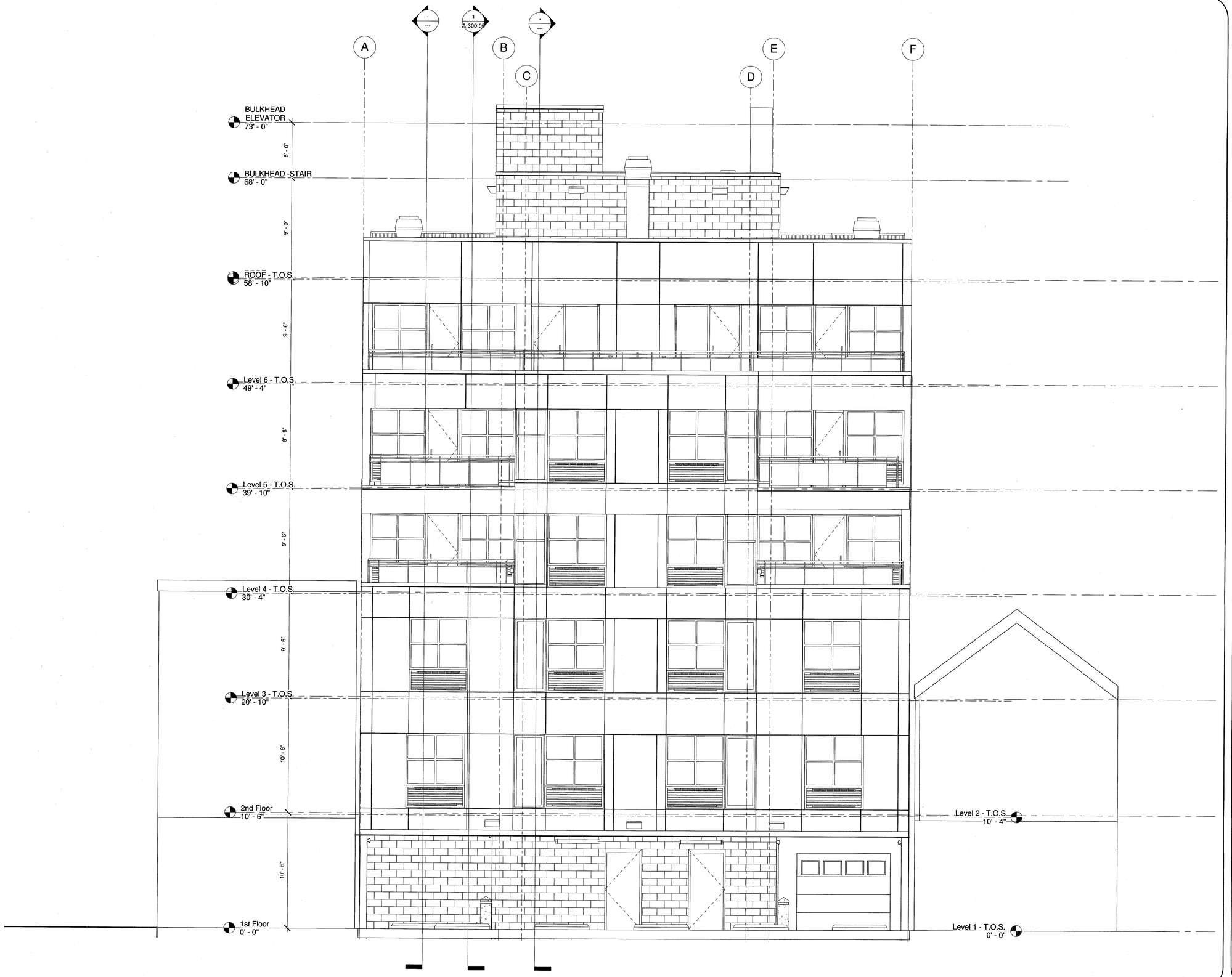

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Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:** MBJ

Drawing Name:

WEST ELEV

Drawing Number:

A-201.00

SHEET35of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
No. 024679
STATE OF NEW YORK

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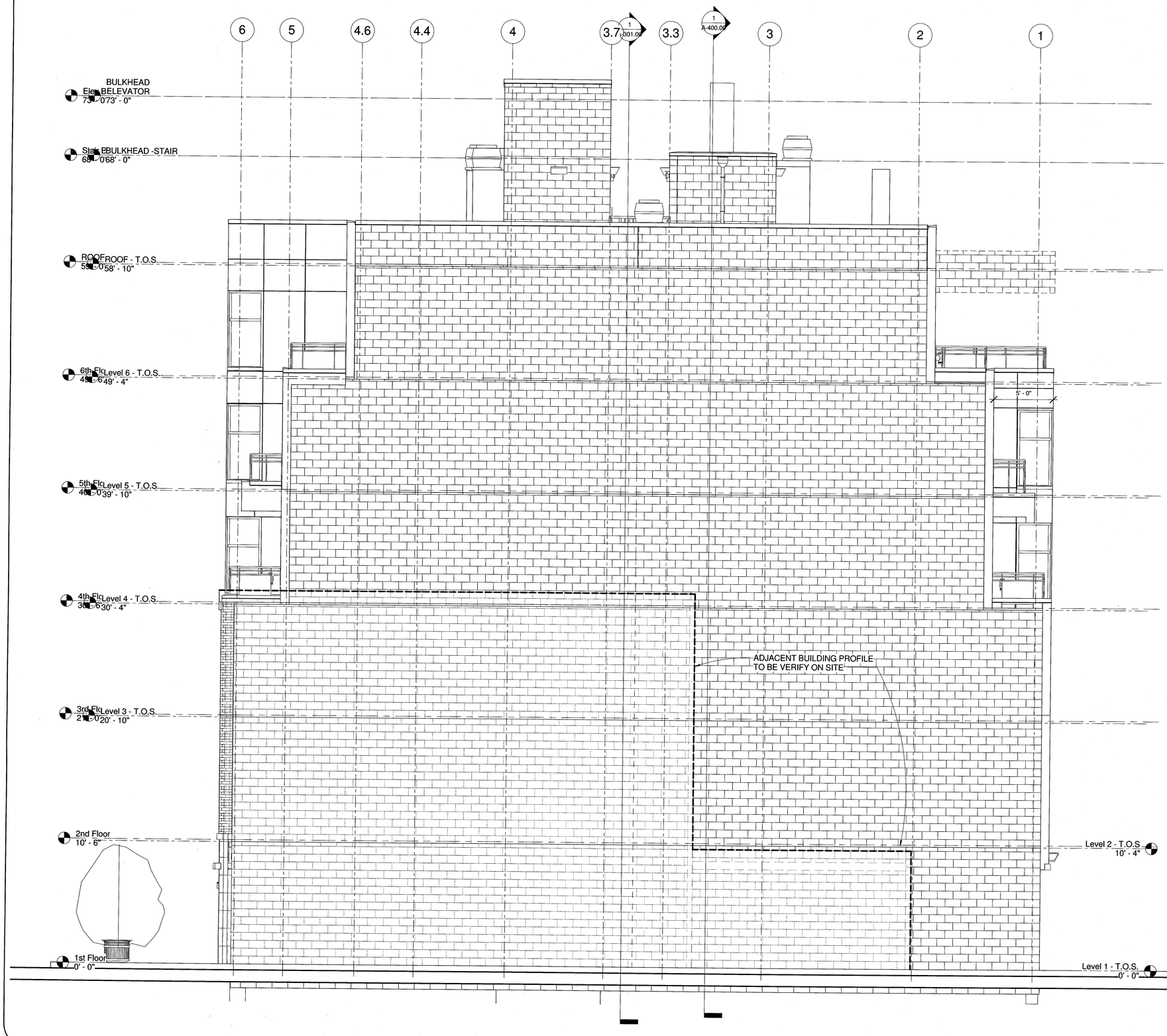

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Drawn By:	Approved By: MBJ

Drawing Name:

NORTH ELEV

Drawing Number:

A-202.00

SHEET36of 102

Initial Date:

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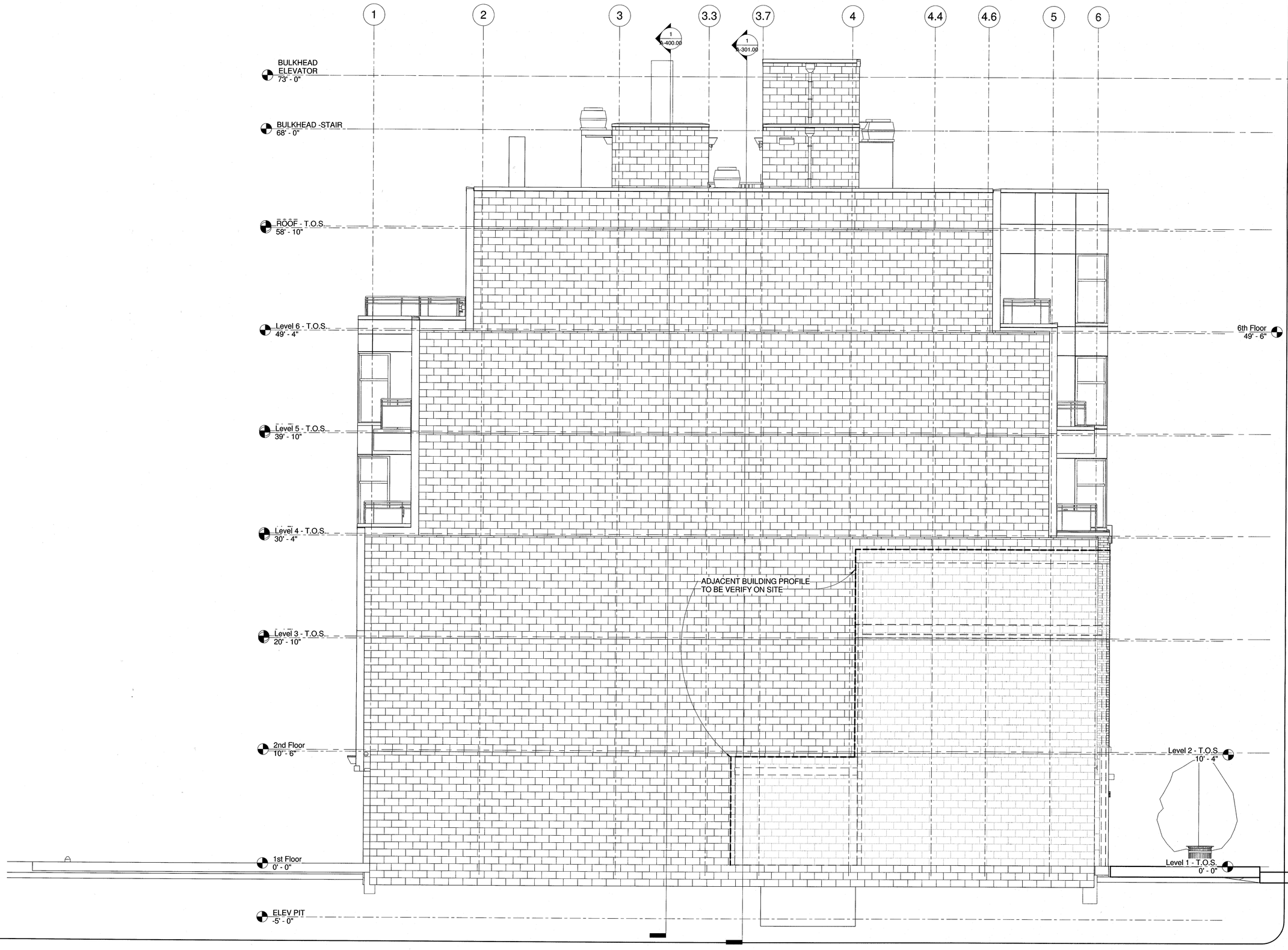

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Drawing Number:

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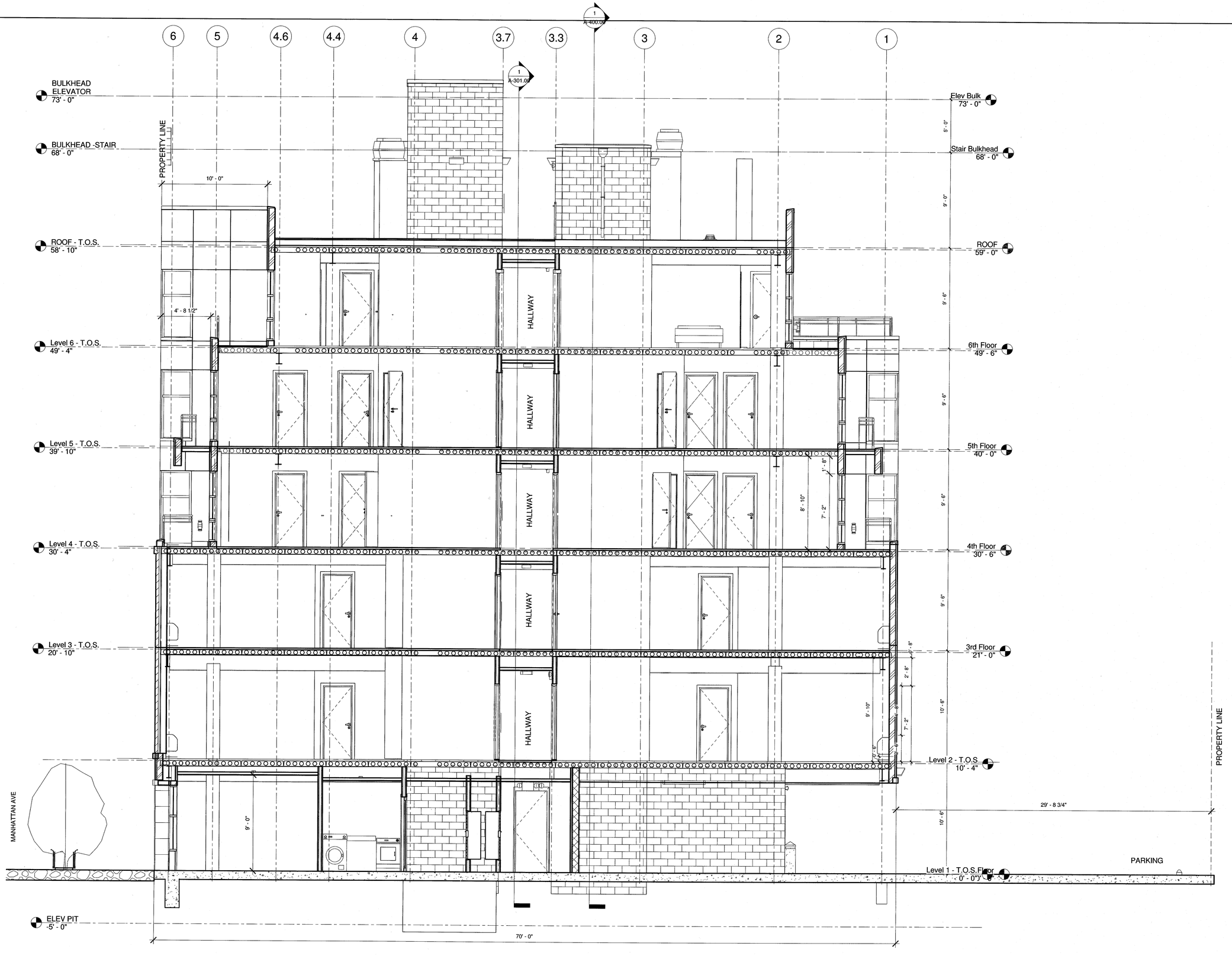

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VT LIC 8849

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FREDRICK KINCAID, RA | NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA-278177

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	Approved By: MBJ

Drawing Name:
SECTION 1

Drawing Number:
A-300.00

SHEET38of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL STATE OF NEW YORK

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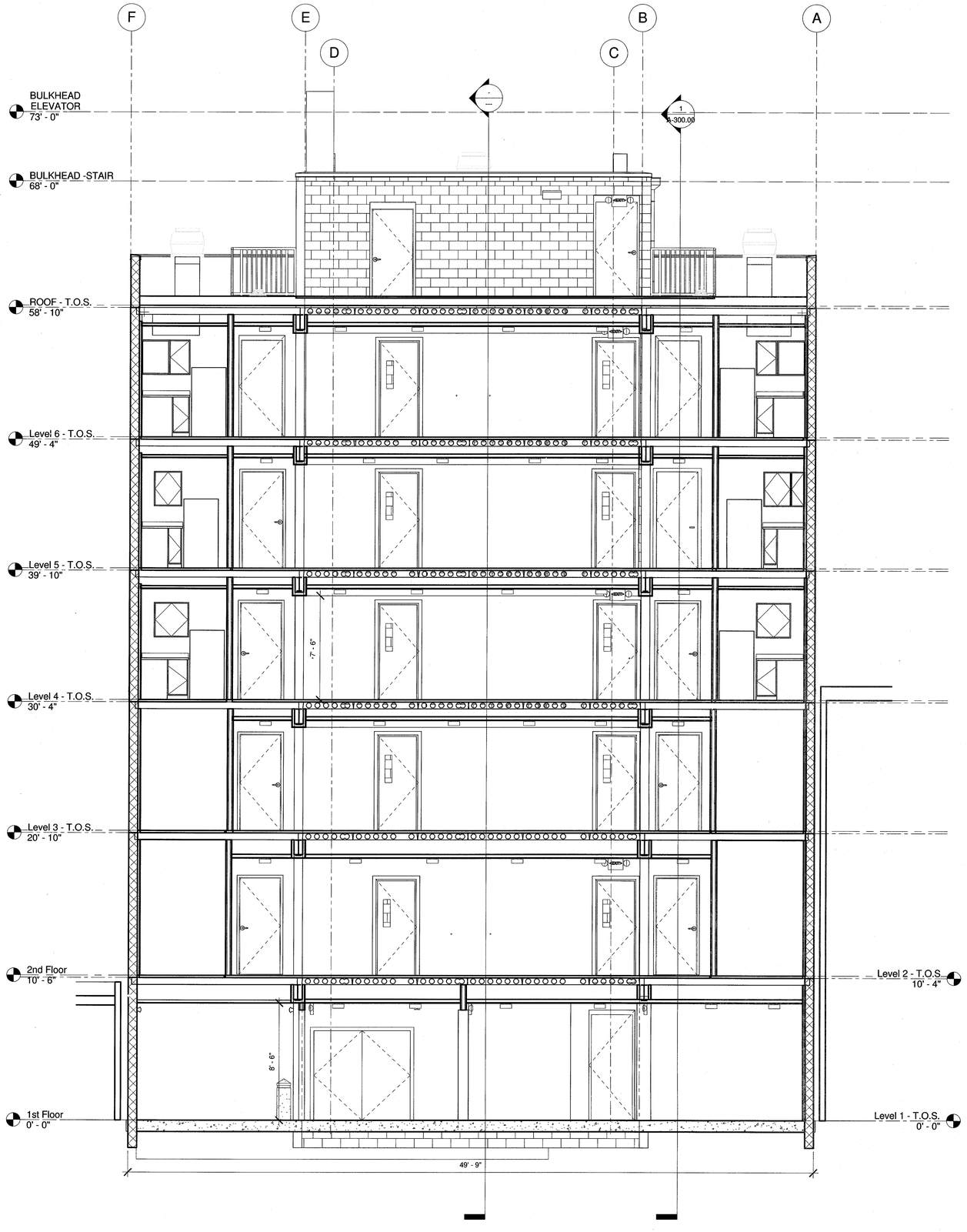

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Drawing Name:
SECTION 2

Drawing Number:
A-301.00

SHEET39of 102

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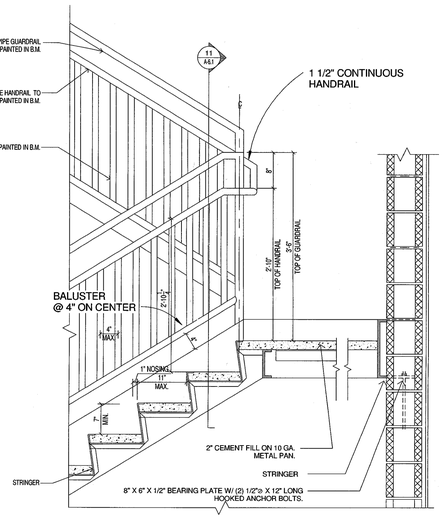

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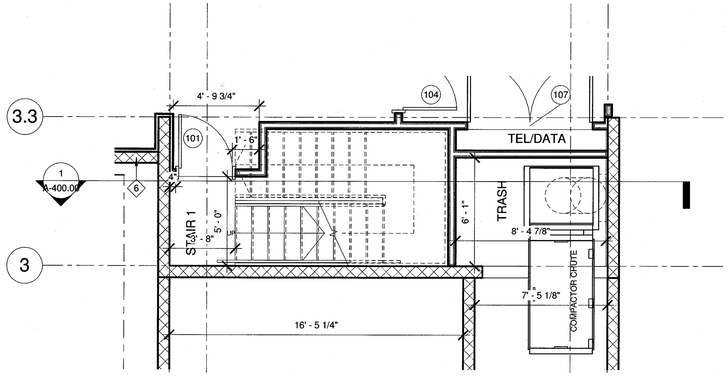

1 1ST FLOOR STAIR PLAN
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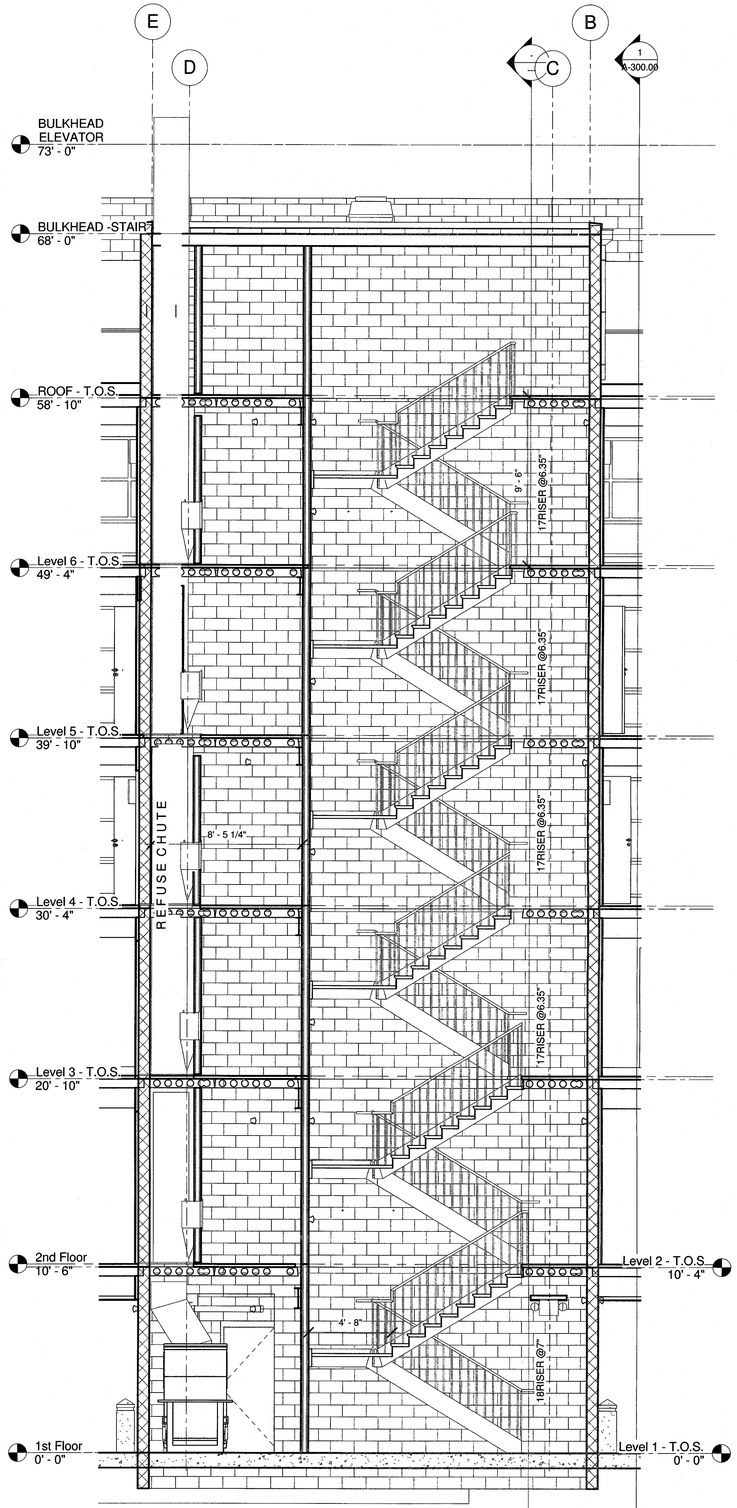

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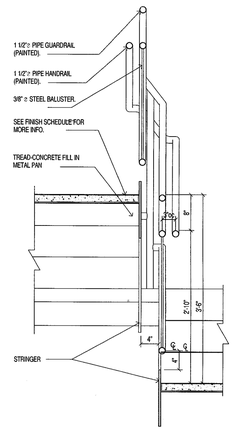

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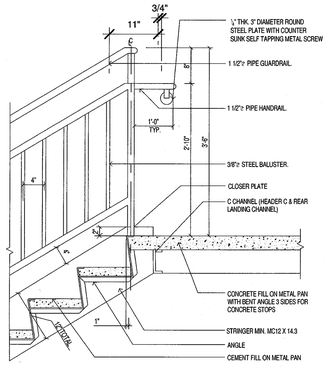

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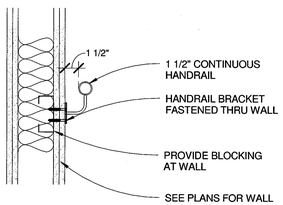

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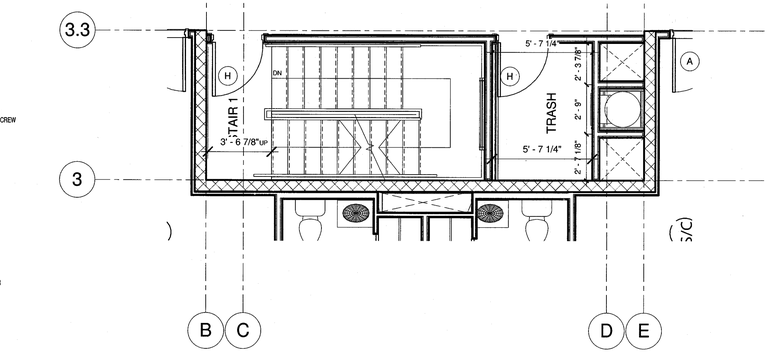

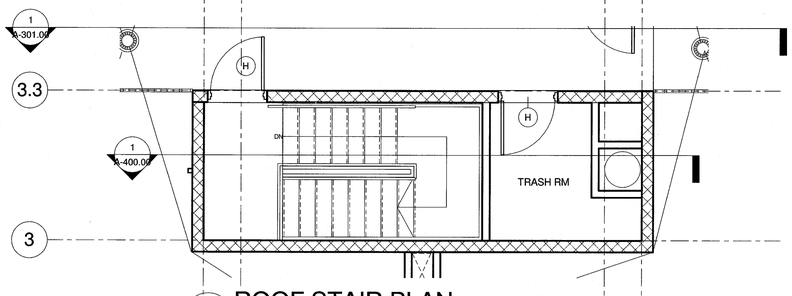

3 ROOF STAIR PLAN
SCALE : 1/4" = 1'-0"

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NJ State Board of Architects Authorization No. 161
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Project:
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BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
	MBJ

Drawing Name:
STAIR & CHUTE DETAIL

Drawing Number:
A-400.00

SHEET40of 102
Initial Date:

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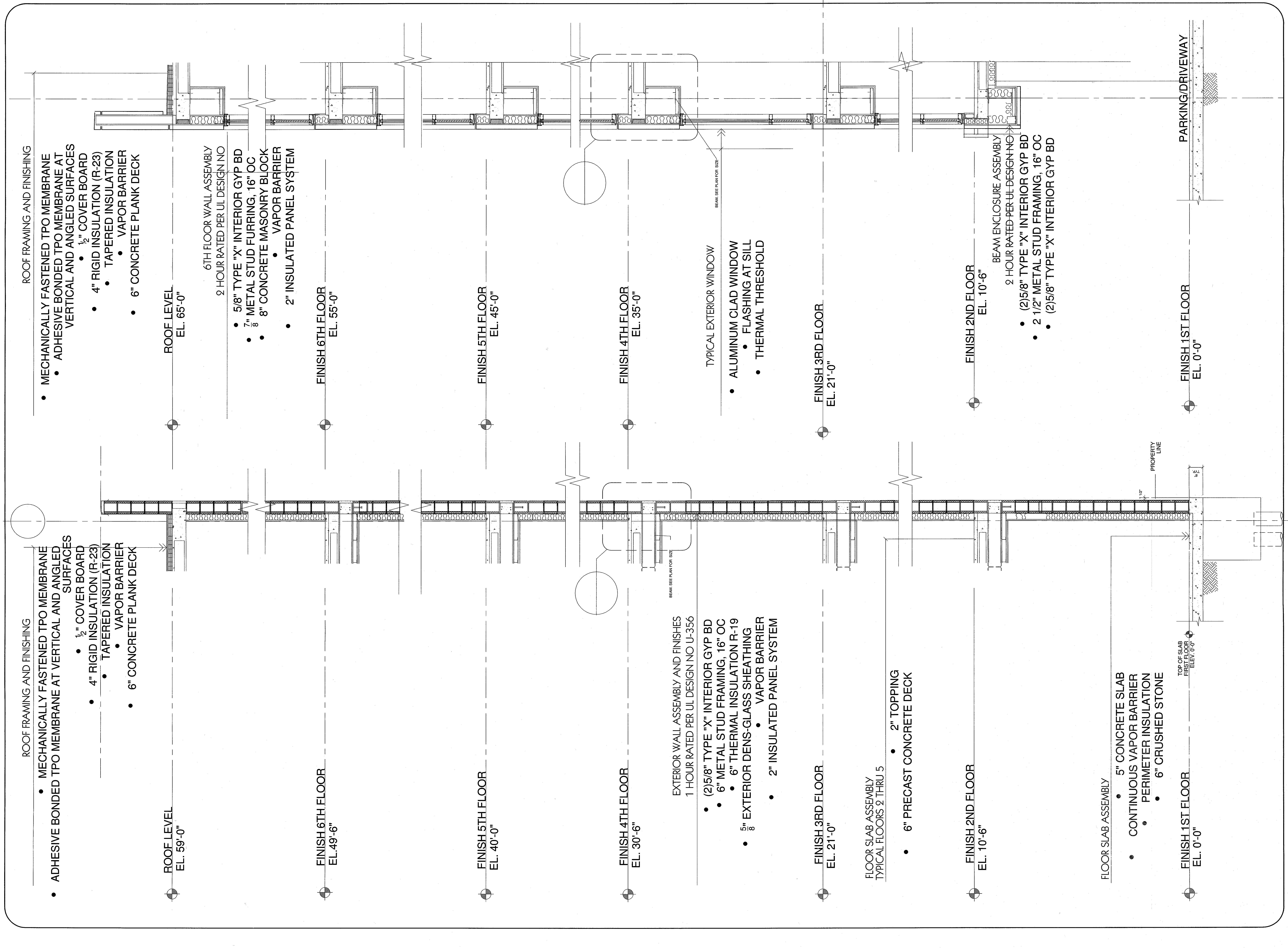

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CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:** MBJ

Drawing Name:

WALL SECTION AT BLOCKWALL & METAL PANEL

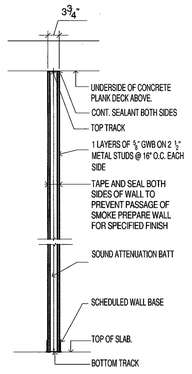
Drawing Number:

A-401.00

SHEET41of 102

Initial Date:

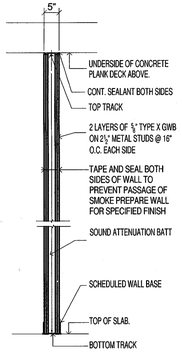
MATTHEW B. JARMEL
REGISTERED ARCHITECT
STATE OF NEW YORK



WALL TYPE

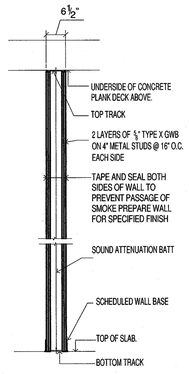
1 — **System Performance**
Non Rated

1A — WITHOUT SOUND INSULATION



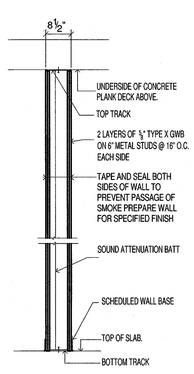
WALL TYPE

2 — **System Performance**
2 HR Fire
UL Design No. U411



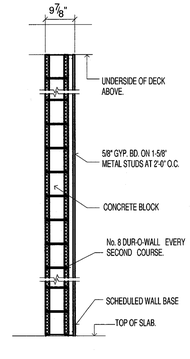
WALL TYPE

3 — **System Performance**
2 HR Fire
UL Design No. U411



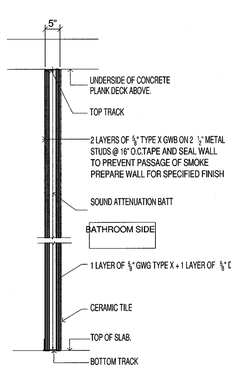
WALL TYPE

4 — **System Performance**
2 HR Fire
UL Design No. U411



WALL TYPE

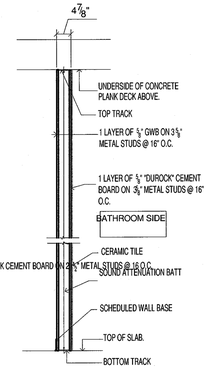
5 — **System Performance**
2- HR Fire CMU Wall
UL Design No. U905



WALL TYPE

6 — **System Performance**
2 HR Fire
UL Design No. U411

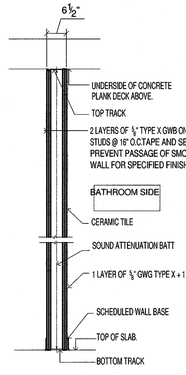
6A — CERAMIC TILE ON BOTH SIDES: (REPLACE 1 LAYER OF GWB BD. WITH ½" DUROCK CEMENT BOARD)



WALL TYPE

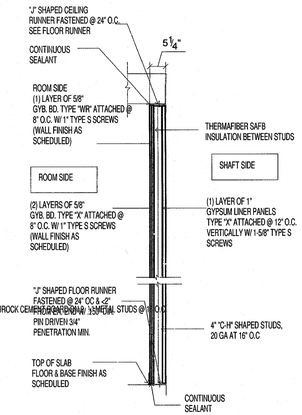
7 — **System Performance**
Non Rated

7A — CERAMIC TILE ON BOTH SIDES: (REPLACE 1 LAYER OF GWB BD. WITH ½" DUROCK CEMENT BOARD)



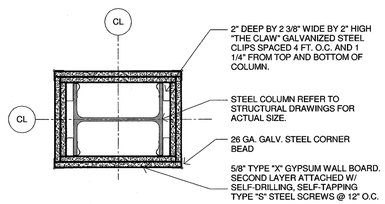
WALL TYPE

8 — **System Performance**
2 HR Fire
UL Design No. U411

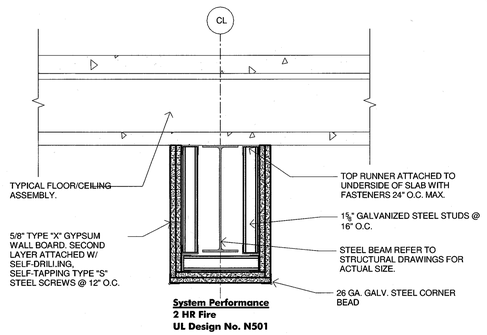


PARTITION TYPE - SHAFT WALL

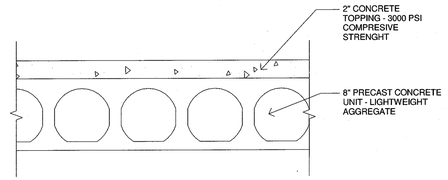
9 — **System Performance**
2- HR Fire Shaftwall
UL Design No. U415



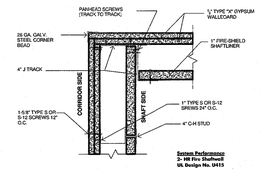
System Performance
2 HR Fire
UL Design No. X536



System Performance
2 HR Fire
UL Design No. N501



System Performance
3 HR Fire
UL Design No. J909



System Performance
2- HR Fire Shaftwall
UL Design No. U415

System No. HW-D-0044
Assembly Ratings - 1, 2, 3 and 4 Hr (See Item 2)
Nominal Joint Widths - 1 and 2 In. (See Item 3)
L Rating At Ambient - Less Than 1 CFM/Lin Ft
L Rating At 400°F - Less Than 1 CFM/Lin Ft
Class II Movement Capabilities - 19% and 25% Compression and Extension (See Item 3)

1. **Floor Assembly** - Min 4-1/2 in. (114 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) structural concrete.
2. **Wall Assembly** - 1, 2, 3 or 4 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners** - Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). When deflection channel (Item 3A) is used, flange height of ceiling runner is to be equal to or greater than flange height of deflection channel and the ceiling runner is to nest within the deflection channel with a 3/4 to 1 in. (19 to 25 mm) gap maintained between the top of the ceiling runner and the top of the deflection channel. When deflection channel is not used, flange height of ceiling runner shall be min 3/4 in. (19 mm) greater than nom joint width. Ceiling runner is secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC.

A1. **Light Gauge Framing* - Slotted Ceiling Runner** - When nom joint width is less than or equal to 1-3/4 in. (45 mm), slotted ceiling runner may be used as an alternate to the ceiling runner in Item 2A. Slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

BRADY CONSTRUCTION INNOVATIONS INC,
DBA SLIPTRACK SYSTEMS - SLP-TRK
CALIFORNIA EXPANDED METAL PRODUCTS CO - CST
CLARKWESTERN BUILDING SYSTEMS INC - Type SLT, SLT-H
METAL-LITE INC - The System
SCAFCO STEEL STUD MANUFACTURING CO
TELLING INDUSTRIES L L C - True-Action Deflection Track
THE STEEL NETWORK INC - VertiTrack VT, series,250VT, 362VT, 400VT, 600VT and 800VT

A2. **Light Gauge Framing* - Vertical Deflection Ceiling Runner** - When nom joint width is less than or equal to 1 in. (25 mm), vertical deflection ceiling runner may be used as an alternate to the ceiling runner in Items 3A and 3A1., Vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Vertical deflection ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When vertical deflection ceiling runner is used, deflection channel (Item 4A) shall not be used.

THE STEEL NETWORK INC - VertiTrack VTD362, VTD400, VTD600 and VTD800

A3. **Light Gauge Framing* - Clipped Ceiling Runner** - As an alternate to the ceiling runner in Items 2A and 2A1, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-3/4 in. (70 mm) Clipped ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 12 in. (305 mm) OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS L L C - Snap Trak

A4. **Light Gauge Framing*- Notched Ceiling Runner** - As an alternate to the ceiling runners in Items 2A through 2A3, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When notched ceiling runner is used, deflection channel (Item 3A) shall not be used.

OLMAR SUPPLY INC - Type SCR

A5. **Light Gauge Framing* -Vertical Deflection Clip*** - (Optional) Steel clips can be used in conjunction with steel studs (Item 2B), ceiling runner (Item 2A) or deflection channel (Item 3A). Clips installed over the top of studs and inserted within the ceiling runner or deflection channel. Clip shall be secured to the ceiling runner or deflection channel with No. 8 self drilling, self tapping steel fasteners through holes provided within the clip. Clip may be secured to the stud with No. 6 pan head steel screw through holes provided within the clip. As an alternate, the legs of the clip may be installed over the top of the stud without attachment in accordance with manufacturer's installation instructions.

FLEX-ABILITY CONCEPTS L L C - Three Legged Dog Deflection Clip

A6. **Steel Framing Members* - Sound Isolation Clips -** (Not Shown, For Max 2 Hr Rating) - As an alternate attachment means for the ceiling runner to the underside of the floor when no deflection channel (Item 3A) is used, sound isolation clips installed in accordance with the accompanying installation instructions. Sound isolation clip installed through nom 1 in. (25 mm) diam hole in ceiling runner and attached to top of ceiling runner using four min No. 8 by 1/2 in. (13 mm) long self-tapping galv steel screws. Sound isolation clips to be installed adjacent to every stud location but not more than 24 in. (610 mm) OC and attached to the underside of floor assembly using min 3/16 in. (5 mm) diam by 2-1/2 in. (64 mm) long steel masonry anchors.

PAC INTERNATIONAL INC - Type RSIC-U-HD

B. **Studs** - Steel studs to be min 3-1/2 in. (89 mm) wide. Studs cut 1/2 to 1 in. (13 to 25 mm) less in length than assembly height with bottom nesting in and secured to floor runner. When deflection channel (Item 3A) is used, steel studs attached to ceiling runner (Item 2A) with sheet metal screws located 1/2 in. (13 mm) below the bottom to the deflection channel. When deflection channel is not used, studs to nest in ceiling runner without attachment. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. (13 mm) long water head steel screws at midheight of slot on each side of wall. When vertical deflection ceiling runner (Item 2A2) is used, steel studs secured to slotted vertical deflection clips, through the bushings, with steel screws at midheight of each slot. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board*** - Gypsum board sheets installed to a min total 5/8 in., 1-1/4 in., 1-1/2 in. or 2 in. (16, 32, 38 or 51 mm) thickness on each side of wall for 1, 2, 3 or 4 hr rated assemblies, respectively. Wall to be constructed as specified in the individual U400 Series Design in the UL Fire Resistance Directory, except that a max 1 or 2 In. (25 or 51 mm) gap (See Item 3) shall be maintained between the top of the gypsum board and the lower surface of the floor . The screws attaching the gypsum board to the studs along the top of the wall shall be located 1 in. (25 mm) below the bottom of the ceiling runner. No gypsum board attachment screws shall be driven into the ceiling runner or into the optional deflection channel.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Joint System - Max separation between bottom of floor and top of gypsum board (at time of installation of joint system) is 2 in. (51 mm) for 1 and 2 hr ratings and 1 in. (25 mm) for 3 and 4 hr ratings. The joint system is designed to accommodate a max 25 percent compression or extension from it's installed width for 1 and 2 hr ratings and a max 19 percent compression or extension from it's installed width for 3 and 4 hr ratings.** The joint system shall consist of forming and fill materials, with or without a deflection channel (Item 3A), as follows:

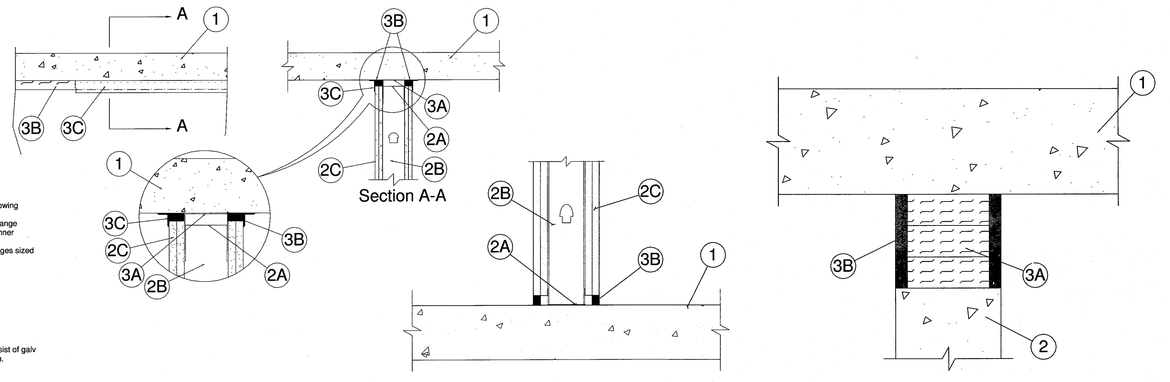
A. **Deflection Channel** - (Optional) - Max 3 In. (76 mm) deep min 24 gauge galv steel channel sized to accommodate ceiling runner (Item 2A). Deflection channel secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1/2 to 3/4 in. (13 to 19 mm) gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner nests inside the deflection channel without attachment.

B. **Forming Material*** - Sections of min 4 pcf (64 kg/m3) density mineral wool batt compressed 50 percent in thickness and installed cut edge first to completely fill the gap between the top of the gypsum board and the bottom of the concrete floor. When sound isolation clips (Item 2A6) are used, the space between the top of the ceiling runner and the underside of the floor shall be tightly packed with mineral wool batt insulation. The forming material shall be installed flush with both surfaces of wall.

FIBREX INSULATIONS INC - FBX Safing Insulation
IG MINWOOL L L C - MinWool-1200 Safing
ROXUL ASIA SDN BHD - Safe
ROXUL INC - Safe
ROCK WOOL MANUFACTURING CO - Delta Board
THERMAFIBER INC - SAF

C. **Fill, Void or Cavity Material* - Sealant -** Min 1/16 in. (1.6 mm) dry thickness (1/8 in. or 3.2 mm wet thickness) of fill material spray applied on each side of the wall between the top of the wall and the bottom of the floor, and overlap a min 1/2 in. (13 mm) onto gypsum board on both sides of wall. Additional 1/16 in. (1.6 mm) dry thickness (1/8 in. or 3.2 mm wet thickness) of fill material shall overlap a min 1/2 in. (13 mm) onto the floor on both sides of wall.

SPECIFIED TECHNOLOGIES INC - SpecSeal AS200 Elastomeric Spray
*Bearing the UL Classification Mark



System No. BW-S-0003
Assembly Ratings - 1 and 2 Hr (See Item 2)
L Rating At Ambient - Less Than 1 CFM/Lin Ft (See Item 3B)
L Rating At 400°F - Less Than 1 CFM/Lin Ft (See Item 3B)
Joint Width - 3/4 In. Max

1. **Floor Assembly** - Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) structural concrete. Floor may also be constructed of any 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***.
See **Precast Concrete Units** category in the Fire Resistance Directory for names of manufacturers.
2. **Wall Assembly** - The 1 or 2 h fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory. In addition, the wall may incorporate a head-of-wall joint system constructed as specified in the HW Series Joint Systems in the UL Fire Resistance Directory. The wall shall include the following construction features:
A. **Steel Floor Runner -** Floor runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Floor runners to be provided with min 1-1/4 in. (32 mm) flanges. Runners secured with steel fasteners spaced 12 in. (305 mm) OC.
B. **Studs** - Steel studs to be min 3-1/2 in. (89 mm) wide. Studs cut 1/2 to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in, resting on and fastened to floor runner with sheet metal screws. Stud spacing not to exceed 24 in. (610 mm) OC.
C. **Gypsum Board* -** Gypsum board installed to a min total thickness of 5/8 in. (16 mm) or 1-1/4 in. (32 mm) on each side of wall for a 1 or 2 hr fire rated wall, respectively. Wall to be constructed as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory except that a max 3/4 in. (19 mm) gap shall be maintained between the bottom of the gypsum board and the top of the concrete floor.
The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.
3. **Joint System - Max separation between top of floor and bottom of gypsum board is 3/4 in. (19 mm).** The joint system consists of a packing material and a fill material, as follows:
A. **Packing Material -** (Optional, Not Shown) - Mineral wool batt insulation, polyethylene backer rod or glass fiber insulation firmly packed into the gap between the bottom of the gypsum board and the top of the concrete floor and recessed from each surface of the wall to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Material*-Sealant -** Min 1/2 in. (13 mm) thickness of fill material installed on each side of the wall between the bottom of the gypsum board and the top of the concrete floor, flush with each surface of the wall. When mineral wool batt insulation is used as a packing material, min thickness of fill material on each side of the wall is 1/4 in. (6 mm).
SPECIFIED TECHNOLOGIES INC - SpecSeal ES Sealant, SpecSeal LCI Sealant, SpecSeal LC150 Sealant, Pensil 300 Sealant or SpecSeal Series SIL300.
Note: L Ratings apply when SpecSeal ES Sealant is used.
*Bearing the UL Classification Mark

System No. HW-D-1006
Assembly Rating - 3 Hr
Nominal Joint Width - 4 In.
L Rating At Ambient - Less Than 1 CFM/Lin Ft
L Rating At 400°F - Less Than 1 CFM/Lin Ft
Class II Movement Capabilities - 15% Compression or Extension

1. **Floor Assembly -** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) structural concrete.
2. **Wall Assembly -** Min 5 in. (127 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.
See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.
3. **Joint System - Max separation between bottom of floor and top of wall (at time of installation of joint system) is 4 in. (102 mm). The joint system is designed to accommodate a max 15 percent compression or extension from it's installed width.** The joint system shall consist of the following:
A. **Forming Material* -** Min 4 pcf (64 kg/m3) mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 4 in. (102 mm) and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 33 percent in thickness and that the compressed batt sections are recessed from each surface of the wall as required to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 16 in. (406 mm) apart along the length of the joint.
FIBREX INSULATIONS INC - FBX Safing Insulation
IG MINWOOL L L C - MinWool-1200 Safing
ROCK WOOL MANUFACTURING CO - Delta Board
ROXUL ASIA SDN BHD - SAFE
ROXUL INC - SAFE
THERMAFIBER INC - Type SAF
B. **Fill, Void or Cavity Material* - Sealant -** Min 1/2 in. (13 mm) thickness of fill material applied within the joint, flush with each surface of wall.
SPECIFIED TECHNOLOGIES INC - SpecSeal ES Sealant
*Bearing the UL Classification Mark

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Architecture
Engineering
Interior Design
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ISSUE

NO.	DATE	DESCRIPTION	INT.
01	03.19.15	FILING & PRICING	MBJ

REVISION

NO.	DATE	DESCRIPTION	INT.

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DE	LIC SS-0000?256	NC	LIC 10120
FL	LIC AR94034	NH	LIC 3501
GA	LIC RA011484	NY	LIC 034673
IA	LIC 05577	OH	LIC A-99-12444
IL	LIC 001.020069	PA	LIC RA-014851-B
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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. "GA-27817"
10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

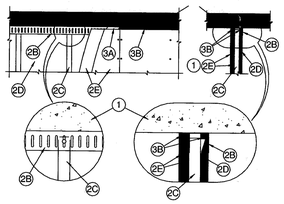
Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
	MBJ

Drawing Name:
WALLTYPES DETAIL

Drawing Number:
A-500.00

SHEET42of 102

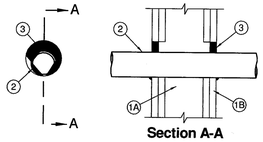
Initial Date:



System No. HW-D-0194
Assembly Ratings - 1 and 2 Hr (See Items 2 and 3B)
Joint Width- 1 in. Max
L Rating At Ambient - Less Than 1 CFM/Lin Ft (See Item 3B)
L Rating At 400°F - Less Than 1 CFM/Lin Ft (See Item 3B)
Class II Movement Capabilities-25 Percent Compression or Extension

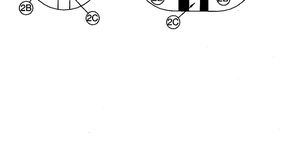
1. **Floor Assembly -** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) structural concrete.
2. **Shaft Wall Assembly -** With the exception of the ceiling runner, the 1 or 2 hr fire rated shaft wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400-Series Wall and Partition Design in the UL Fire Resistance Directory. The wall shall include the following construction features:
A. **Floor and Wall Runners -** (Not Shown) - "J"-shaped runner, min 2-1/2 in. (64 mm) wide with unequal legs of 1 in. (25 mm) and 2 in. (51 mm), fabricated from min 24 MSG galv steel. Runners positioned with short leg toward finished side of wall. Runners attached to walls and floor with steel fasteners spaced max 24 in. (610 mm) OC. As an alternate to the "J"-shaped runner, a min 2-1/2 in. (64 mm) wide by 1 or 1-1/4 in. (25 or 32 mm) deep channel formed from min 24 MSG galv steel may be used for the floor runner.
B. **Light Gauge Framing* - Slotted Ceiling Track -** Slotted ceiling track shall consist of galv steel channels with slotted flanges. Slotted ceiling track sized to accommodate steel "C-H" studs (Items 2C). Attached to concrete at ceiling with steel fasteners spaced max 12 in. OC (305 mm).
BRADY CONSTRUCTION INNOVATIONS INC,
DBA SLIPTRACK SYSTEMS - SLP-TRK
CALIFORNIA EXPANDED METAL PRODUCTS CO - CST
CLARKWESTERN BUILDING SYSTEMS INC - Type SLT, SLT-H
SCAFCO STEEL STUD MANUFACTURING CO
STEELER INC - Steeler Slotted Ceiling Runner
TELLING INDUSTRIES L.L.C - True-Action Deflection Track
THE STEEL NETWORK INC - VertiTrack VT, series,250VT, 362VT, 400VT, 600VT and 800VT

C. **Steel Studs -** "C-H"-shaped steel studs to be min 2-1/2 in. (64 mm) wide and formed of min 24 MSG galv steel. Studs cut 1/2 to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in and resting on floor runner and with top nesting in slotted ceiling track. Studs spaced 24 in. (610 mm) OC. After installation of gypsum board liner panels (Item 2D), studs secured to flange of floor runner on finished side of wall only with No. 6 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screws. Studs secured to flange of slotted ceiling track on finished side of wall only with No. 8 by 1/2 in. (13 mm) long self-drilling, self-tapping wafer head steel screws at slot midheight.
D. **Gypsum Board* -** 1 in. (25 mm) thick by 24 in. (610 mm) wide gypsum board liner panels as specified in the individual U400 or V400-Series Wall and Partition Design. Panels cut 1 in. (25 mm) less in length than floor to ceiling height. Vertical edges inserted in "H"-shaped section of "C-H" studs. Free edge of end panels attached to long leg of "J" runner (Item 2A) with 1-5/8 in. (41 mm) long Type S steel screws spaced max 12 in. (305 mm) OC.
E. **Gypsum Board* -** Gypsum board sheets, 1/2 or 5/8 in. (13 or 16 mm) thick, applied vertically or horizontally in one or two layers on finished side of wall as specified in the individual U400 or V400-Series Wall and Partition Design. A max 1 in. (25 mm) gap shall be maintained between the top of the gypsum board and the bottom surface of the concrete floor. The screws attaching the gypsum board layers to the C-H studs shall be located 1 in. (25 mm) below the bottom of the slotted ceiling track (Item 2C). No gypsum board attachment screws are to penetrate the slotted ceiling track.
The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.
3. **Joint System -** Max separation between bottom of floor and top of liner panel (Item 2D) and between bottom of floor and top of gypsum board sheets (Item 2E) at time of installation of joint system is 1 in. (25 mm). The joint system is designed to accommodate a maximum 25 percent compression or extension from its installed width. The joint system consists of bond breaker tape and sealant, as follows:
A. **Bond Breaker Tape -** Polyethylene tape supplied in rolls. Tape applied to flanges of slotted ceiling track (Item 2D) to prevent bonding of the sealant at points other than the top and bottom of the linear gap. Bond breaker tape is optional when movement capability of the joint is limited to compression only.
B. **Fill, Void or Cavity Material* - Sealant -** Min 1 in. (25 mm) depth of sealant to be installed to fill linear gap between top of gypsum board liner panel (Item 2D) and top inside surface of slotted ceiling track (Item 2B) prior to installation of gypsum board sheets on finished side of wall. For 1 hr fire rated walls, min 5/8 in. (16 mm) depth of sealant to be installed to fill linear gap between top of gypsum board sheet (Item 2E) and bottom of concrete floor. For 2 hr walls, min 1 in. (25 mm) depth of sealant to be installed to fill linear gap between top of gypsum board sheets (Item 2E) and bottom of concrete floor.
SPECIFIED TECHNOLOGIES INC - SpecSeal ES Elastomeric Sealant or SpecSeal LCI Sealant. **L Ratings apply when SpecSeal ES Elastomeric Sealant is used. When SpecSeal LCI Sealant is used, the movement capability of the joint is limited to 25 percent in compression only.**
*Bearing the UL Classification Mark



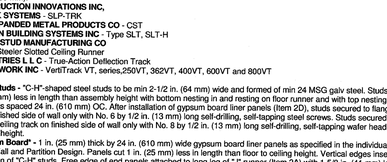
System No. W-L-2241
F Ratings - 1 and 2 Hr (See Item 1)
T Ratings - 0, 1/4, 1 and 1-3/4 Hr (See Item 2)
L Rating At Ambient - Less Than 1 CFM/sq ft
L Rating At 400 F - Less Than 1 CFM/sq ft

1. **Wall Assembly -** The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction featu es:
A. **Studs -** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.
B. **Gypsum Board* -** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design.Diam of opening to be 1 in. to 1-1/8 in. (25 to 29 mm) larger than outside diam of pipe.
The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Through Penetrant -** One nonmetallic pipe, conduit or tube to be installed eccentrically or concentrically within the firestop system. Pipe, conduit or tube to be rigidly supported on both sides of the wall assembly. The following types and sizes of nonmetallic pipes, conduits and tubes may be used:
A. **Polyvinyl Chloride (PVC) Pipe -** Nom 2 in. (51 mm) diam (or smaller) Schedule 40 solid or cellular core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems. Annular space shall be min 0 in. (0 mm, point contact) to max 1 in. (25 mm).
B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe -** Nom 2 in. (51 mm) diam (or smaller) SDR 13.5 or Schedule 80 CPVC pipe for use in closed (process or supply) piping systems. Annular space shall be min 0 in. (0 mm, point contact) to max 1 in. (25 mm).
C. **Rigid Nonmetallic Conduit+** - Nom 2 in. (51 mm) diam (or smaller) Schedule 40 PVC conduit installed in accordance with Article 347 of the National Electrical Code (NFPA 70). Annular space shall be min 0 in. (0 mm, point contact) to max 1 in. (25 mm).
D. **Electrical Nonmetallic Tubing+** - Nom 2 in. (51 mm) diam (or smaller) PVC tubing installed in accordance with Article 331 of the National Electrical Code (NFPA 70). Annular space shall be min 0 in. (0 mm, point contact) to max 1 in. (25 mm).
E. **Cross Linked Polyethylene (PEX) Tubing -** Nom 1 in. (25 mm) diam (or smaller) SDR9 PEX tubing for use in closed (process or supply) piping systems. Annular space shall be min 0 in. (0 mm, point contact) to max 1 in. (25 mm).
F. **Acrylonitrile Butadiene Styrene (ABS) pipe -** Nom 1-1/2 in. (38 mm) diam (or smaller) Schedule 40 solid-core or cellular core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems. Annular space shall be min 1/4 in. (6 mm) to max 3/4 in. (19 mm).
When item 2A or 2B is used, the T Rating is 1/4 hr. When Item 2C, 2D, or 2E is used, the T Rating is 1 hr and 1-3/4 hr for 1 hr and 2 hr fire rated walls, respectively. When Item 2F is used, T Rating is 0 hr.
3. **Fill, Void or Cavity Material* - Sealant -** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At point contact location, min 1/4 in. (6 mm) diam bead of fill material applied at nonmetallic pipe/gypsum board interface on both surfaces of wall.
SPECIFIED TECHNOLOGIES INC - SpecSeal LCI Sealant or Type WF300 Firestop Caulk (for wood studs only)
*Bearing the UL Classification Mark



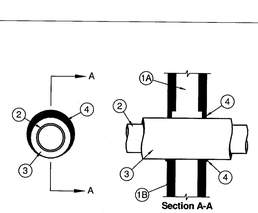
System No. W-L-7025
F Ratings - 1 and 2 Hr (See Item 1)
T Rating - 1/2 Hr
L Rating At Ambient - Less than 1 CFM/sq ft
L Rating at 400 F - Less Than 1 CFM/sq ft

1. **Wall Assembly -** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
A. **Studs -** Wall framing shall consist of min 3-1/2 in. (89 mm) wide steel channel studs spaced max 24 in. (610 mm) OC. Additional steel studs shall be used to completely frame the opening.
B. **Gypsum Board* -** 5/8 in. (16 mm) thick, 4 ft (1.22 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory. Max area of opening is 73.7 sq ft (6.85 m2) with a max dimension of 104 in. (2.64 m).
The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Steel Duct -** Max 100 in. by 100 in. (2.54 by 2.54 m) No. 26 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. The space between the steel duct and perijhery of opening shall be min 0 in. (0 mm, point contact) to max 2 in. (51 mm). Steel duct to be rigidly supported on both sides of the wall assembly.
3. **Firestop System -** The firestop system shall consist of the following:
A. **Packing Material -** (Optional, Not Shown) - Polyethylene backer rod, mineral wool batt insulation or fiberglass batt insulation friction fitted into annular space. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Material* - Sealant -** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. Min 1/4 in. (6 mm) diam bead of fill material shall be applied at the point contact location between the steel duct and the gypsum board. For 2 hr Rated walls when LC150 or LE600 Sealant is used, fill material thickness installed to full depth of gypsum board layers on each side of wall assembly.
SPECIFIED TECHNOLOGIES INC - SpecSeal Series SSS Sealant, SpecSeal LCI Sealant, Pensil 300 Sealant or SpecSeal Series SIL300 Sealant for floors or walls and Pensil 300SL Sealant or SpecSeal Series SIL300SL Sealant for floors only.
W Rating applies only when Pensil 300 Sealant, SpecSeal Series SIL300, Pensil 300 S/L or SpecSeal Series SIL300SL Sealants are used.
F Rating is 2 Hr when Pensil 300 Silicone Sealant or Pensil 300SL Silicone Sealant is used. F Rating is 3 Hr when all other sealants are used.
C. **Retaining Angles -** Min 16 GA galv steel angles sized to lap duct a min of 2 in. (51 mm) and lap periphery of opening a min of 1 in. (25 mm). Angles attached to all four sides of steel duct on top surface of floor or on both surfaces of wall with No. 10 (or larger) steel sheet metal screws spaced 1 in. (25 mm) from each end and max 4 in. (102 mm) OC.
*Bearing the UL Classification Mark



SYSTEM NO. C-AJ-7027
F RATING - 2 OR 3 HR (SEE ITEM 3B)
T RATING - 0 HR
L RATINGS AT AMBIENT - LESS THAN 1 CFM/SQ FT
L RATINGS AT 400 F - LESS THAN 1 CFM/SQ FT
W RATING - CLASS 1 (SEE ITEM 3B)

1. **Floor or Wall Assembly -** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max area of opening is 2560 in.2 (1.65 m3) with max dimension of 64 in. (1.6 m).
See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.
2. **Steel Duct -** Max 60 by 36 in. (1524 by 914 mm) steel duct. Steel gauge of duct shall conform with SMACNA requirements. One duct to be installed within the firestop system. The annular space shall be min 0 in. (point contact) to max 2 in. (51 mm) Steel duct to be rigidly supported on both sides of floor or wall assembly.
3. **Firestop System -** The firestop system shall consist of the following:
A. **Packing Material -** Min 3 in. (76 mm) thickness of min 4 pcf (64 kg/m3) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor and from both surfaces of wall to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Material* - Sealant -** Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor and both surfaces of wall. At point contact location between steel duct and concrete floor or wall, apply min 3/8 in. (10 mm) diam bead at steel duct/concrete interface on top surface of floor or both surfaces of wall.
SPECIFIED TECHNOLOGIES INC - SpecSeal Series SSS Sealant, SpecSeal LCI Sealant, Pensil 300 Sealant or SpecSeal Series SIL300 Sealant for floors or walls and Pensil 300SL Sealant or SpecSeal Series SIL300SL Sealant for floors only.
W Rating applies only when Pensil 300 Sealant, SpecSeal Series SIL300, Pensil 300 S/L or SpecSeal Series SIL300SL Sealants are used.
F Rating is 2 Hr when Pensil 300 Silicone Sealant or Pensil 300SL Silicone Sealant is used. F Rating is 3 Hr when all other sealants are used.
C. **Retaining Angles -** Min 16 GA galv steel angles sized to lap duct a min of 2 in. (51 mm) and lap periphery of opening a min of 1 in. (25 mm). Angles attached to all four sides of steel duct on top surface of floor or on both surfaces of wall with No. 10 (or larger) steel sheet metal screws spaced 1 in. (25 mm) from each end and max 4 in. (102 mm) OC.
*Bearing the UL Classification Mark

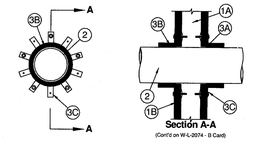


System No. W-L-5054
F Ratings - 1 & 2 Hr. (See Item 1)
T Ratings - 3/4 and 1 Hr.

1. **Wall Assembly -** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
A. **Studs -** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. O.C. with nom 2 by 4 in. lumber end plates and cross braces. Steel studs to be min 3-1/2 in. wide and spaced max 24 in. O.C.
B. **Gypsum Board* -** 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory, Max diam of opening is 7-5/8 in.
The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Through Penetrant -** One metallic pipe or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or tubing may be used:
A. **Steel Pipe -** Nom 4 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
B. **Iron Pipe -** Nom 4 in. diam (or smaller) cast or ductile iron pipe.
C. **Copper Tubing -** Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing.
D. **Copper Pipe -** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.
3. **Tube Insulation - Plastics+ -** Nom 3/4 in. or 1 in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The annular space between penetrating item and periphery of opening shall be min 0 in. (point contact) to max 1-1/2 in. **When 1 in. thick AB/PVC insulation is used, T Rating is 3/4 hr. When 3/4 in. thick AB/PVC insulation is used, T Rating is 1 hr.**
SEE **PLASTICS+** (QMFZ2) CATEGORY IN THE RECOGNIZED COMPONENT DIRECTORY OF NAMES FOR MANUFACTURERS. ANY RECOGNIZED COMPONENT TUBE INSULATION MATERIAL MEETING THE ABOVE SPECIFICATIONS AND HAVING A UL 94 FLAMMABILITY CLASSIFICATION OF 94-5VA MAY BE USED.
4. **FILL, VOID OR CAVITY MATERIAL* - SEALANT -** MIN 5/8 IN. THICKNESS OF FILL MATERIAL APPLIED WITHIN ANNULUS, FLUSH WITH BOTH SURFACES OF WALL. MIN 1/4 IN. DIAM BEAD OF SEALANT TO BE APPLIED AT THE POINT CONTACT LOCATION BETWEEN THE AB/PVC INSULATION AND THE GYPSUM BOARD.
SPECIFIED TECHNOLOGIES INC - SPECSEAL SERIES SSS SEALANT OR SPECSEAL LCI SEALANT
*BEARING THE UL CLASSIFICATION MARK

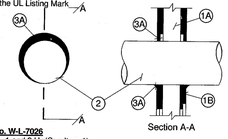
System No. W-L-7026
F Ratings - 1 and 2 Hr (See Item 1)
T Rating - 0 Hr
L Rating At Ambient - Less Than 1 CFM/sq ft
L Rating At 400 F - Less Than 1 CFM/sq ft

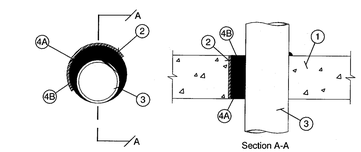
1. **Wall Assembly -** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
A. **Studs -** Wall framing shall consist of min 3-1/2 in. (89 mm) wide steel channel studs spaced max 24 in. (610 mm) OC. When diam of opening exceeds width of stud cavity, additional lengths of steel stud installed to frame out opening around steel duct (Item 2).
B. **Gypsum Board* -** 5/8 in. (16 mm) thick, 4 ft (1.22 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 25-1/2 in. (648 mm).
The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Steel Duct -** Max 24 in. (610 mm) diam No. 28 gauge (or heavier) galv steel vent duct or No. 26 gauge (or heavier) spiral wound galv steel duct. One steel duct to be installed either concentrically or eccentrically within the firestop system. An annular space of min 0 in. (0 mm, point contact) to max 1-1/2 in. (38 mm) is required within the firestop system. Steel duct to be rigidly supported on both sides of the wall assembly.
3. **Firestop System -** The firestop system shall consist of the following:
A. **Packing Material -** (Optional, Not Shown) - Polyethylene backer rod, mineral wool batt insulation or fiberglass batt insulation friction fit into annular space for 2 hr rated wall assemblies only. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material (Item 3B).
B. **Fill, Void or Cavity Material* - Sealant -** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. Min 1/4 in. (6 mm) diam bead of fill material shall be applied at the point contact location between the steel duct and the gypsum board. For 2 hr Rated walls when LC150 or LE600 Sealant is used, fill material thickness installed to full depth of gypsum board layers on each side of wall assembly.
SPECIFIED TECHNOLOGIES INC - SpecSeal Series SSS Sealant, SpecSeal LCI Sealant, SpecSeal LC150 Sealant, or SpecSeal LE600 Sealant
*Bearing the UL Classification Mark



System No. W-L-2074
F Ratings - 1 and 2 Hr (See Item 1)
T Ratings - 3/4, 1 and 2 Hr (See Items 1 and 2)
L Rating At Ambient - Less Than 1 CFM/sq ft
L Rating At 400 F - Less Than 1 CFM/sq ft

1. **Wall Assembly -** The 1 or 2 h fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
A. **Studs -** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced 24 in. (610 mm) OC.
B. **Gypsum Board* -** 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300, U400 or V400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 7 in. (178 mm).
Except as noted in Item 2, the hourly F and T Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Through-Penetrants -** One nonmetallic pipe or conduit to be centered within the firestop system. A nom annular space of 1/8 to 1/4 in. (3 to 6 mm) is required within the firestop system. Pipe or conduit to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes or conduit may be used:
A. **Polyvinyl Chloride (PVC) Pipe -** Nom 6 in. (152 mm) diam (or smaller) Schedule 40 solid core or cellular PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
B. **Flame Retardant Polypropylene (FRPP) Pipe -** Nom 6 in. (152 mm) diam (or smaller) Schedule 40 FRPP pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
C. **Rigid Nonmetallic Conduit+** - Nom 6 in. (152 mm) diam (or smaller) Schedule 40 PVC conduit installed in accordance with the National Electrical Code (NFPA No. 70.)
D. **Chlorinated Polyvinyl Chloride (CPVC)Pipe -** Nom 6 in. (152 mm) diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.
E. **Fiberglass Reinforced Pipe (FRP) -** Nom 6 in. (152 mm) diam (or smaller) glass fiber reinforced thermosetting resin pipe for use in closed (process or control) or vented (drain, waste or vent) piping systems. **When FRP pipe is used, T Rating is 3/4 hr.**
3. **Firestop System -** The firestop system shall consist of the following:
A. **Fill, Void or Cavity Material* - Sealant -** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall.
SPECIFIED TECHNOLOGIES INC - SpecSeal 100, 101, 102, 105, 120 or 129 Sealant, SpecSeal LCI Sealant, Pensil 300 Sealant or SpecSeal Series SIL300 Sealant
B. **Fill, Void or Cavity Material* - Wrap Strip -** Nom 1/8 or 3/16 in. (3.2 or 4.8 mm) thick intumescent material faced on both sides with a plastic film, supplied in 2 in. (51 mm) wide strips or nom 1/4 in. (6 mm) thick intumescent material faced on both sides with a plastic film, supplied in 1-1/2 in. (38 mm) wide strips. Two stacks of wrap strips, each consisting of three wrap strip layers, are individually wrapped around the through-penetrant with the ends butted and held in place with masking tape. Butted ends in successive layers shall be aligned. Wrap strips are installed on each side of wall.
SPECIFIED TECHNOLOGIES INC - SpecSeal BLU Wrap Strip, SpecSeal BLU2 Wrap Strip or SpecSeal RED Wrap Strip
C. **Steel Collar -** Collar fabricated from coils of precut 0.022 in. (0.6 mm) thick (No. 26 MSG) galv sheet steel available from wrap strip manufacturer. Collar shall be min 3 in. (76 mm) deep with min six 1 in. (25 mm) wide by 2 in. (51 mm) long anchor tabs. Retainer tabs, 3/4 in. (19 mm) wide tapering down to 3/8 in. (10 mm) wide and located opposite the anchor tabs, are folded 90 degrees toward through-penetrant surface to maintain the annular space around the through-penetrant and to retain the wrap strips. Steel collar wrapped around wrap strips and through-penetrant with a 1 in. (25 mm) wide overlap along its perimeter joint and secured together by means of three No. 8 by 3/8 in. (10 mm) long steel screws. Wrap strip/steel collar assembly is slid along the through-penetrant until it abuts the surface of the wall. Steel collar lightly screwed to wall and through-penetrant using min 1/2 in. (13 mm) wide by 0.028 in. (0.7 mm) thick stainless steel hose clamp spaced 2 in. (51 mm) OC. Collar secured to wall by a min of six 1/8 in. (3.2 mm) diam by min 1-3/4 in. (45 mm) long molly bolts in conjunction with min 1/4 in. (6 mm) thick stainless steel mounting plates. Steel collar installed on each side of wall.
4. **Firestop Device* -** As an alternate to the wrap strip and the steel collar (Item Nos. 3B and 3C), a firestop device consisting of steel collar lined with an intumescent material sized for it the specific diam of the nonmetallic through penetrant may be used. Device shall be installed in accordance with the installation instructions supplied with the product. The device shall be installed on the each side of the wall and secured to the wall with 1/8 in. (3.2 mm) diam by min 1-3/4 in. (45 mm) long steel molly bolts in conjunction with min 1-1/4 in. (32 mm) diam steel fender washers.
SPECIFIED TECHNOLOGIES INC - SpecSeal Firestop Collar, SpecSeal LCC Collar. When SpecSeal LCC Collar is used, the max annular space shall be 1/8 in. (3 mm) for max 2-1/2 in. (64 mm) diam pipe and shall be max 1/4 in. (6 mm) for pipe larger than 2-1/2 in. (64 mm) diam.
*Bearing the UL Classification Marking
+Bearing the UL Listing Mark



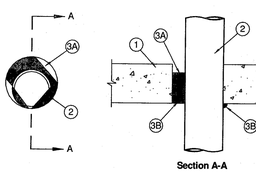


System No. C-AJ-2064
F Rating - 2 and 3 Hr (See Item 3B)
T Rating - 2 and 3 Hr (See Item 3B)
L Rating At Ambient - Less Than 1 CFM/sq ft
L Rating At 400 F - Less Than 1 CFM/sq ft

1. **Floor or Wall Assembly -** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***, Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 3 in. (76 mm).
See **Concrete Blocks** (CAZT) and **Precast Concrete Units** (CFTV) categories in the Fire Resistance Directory for names of manufacturers.
2. **Through Penetrants -** One nonmetallic pipe or conduit to be centered within the firestop system. A nom annular space of 5/16 in. (8 mm) is required within the firestop system. Pipe or conduit to be rigidly supported on both sides of the floor or wall assembly. The following types and sizes of pipes or conduits may be used:
A. **Polyvinyl Chloride (PVC) Pipe -** Nom 2 in. (51 mm) diam (or smaller) Schedule 40 cellular or solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe -** Nom 2 in. (51 mm) diam (or smaller) SDR 17 13.5 CPVC pipe for use in closed (process or supply) piping systems.
C. **Rigid Nonmetallic Conduit+** - Nom 2 in. (51 mm) diam (or smaller) Schedule 40 PVC conduit installed in accordance with the National Electrical Code, (NFPA No. 70).
D. **Acrylonitrile Butadiene Styrene (ABS) Pipe -** Nom 2 in. (51 mm) diam (or smaller) Schedule 40 cellular or solid core ABS pipe for use in closed (process or supply) or vented (drain, waste, or vent) piping systems.
E. **Fire Retardant Polypropylene (FRPP) Pipe -** Nom 2 in. (51 mm) diam (or smaller) Schedule 40 FRPP pipe for use in closed (process or supply) or vented (drain, waste, or vent) piping systems.
F. **Polyvinylidene Fluoride (PVDF) Pipe -** Nom 2 in. (51 mm) diam (or smaller) SDR 32 PVDF pipe for use in closed (process or supply) piping systems.
3. **Firestop System -** The firestop system shall consist of the following:
A. **Fill, Void or Cavity Material* - Sealant -** Prior to the installation of wrap strip (Item 3B) a generous bead of fill material applied around the outer circumference of the wrap strip . When floor is constructed of hollow-core precast concrete unit, min 3/8 in. (10 mm) thickness of fill material applied within annulus, flush with top surface of floor.
SPECIFIED TECHNOLOGIES INC - SpecSeal Series SSS Sealant or SpecSeal LCI Sealant
B. **Fill, Void or Cavity Material* - Wrap Strip -** Nom 1/8 or 3/16 in. (3.2 or 4.8 mm) thick intumescent material faced on both sides with a plastic film, supplied in 2 in. (51 mm) wide strips (BLU or BLU2) or nom 1/8 or 1/4 in. (3.2 or 6 mm) thick intumescent material faced on both sides with a plastic film, supplied in 1-1/2 in. (38 mm) wide strips (RED or RED2). One layer of wrap strip is wrapped around the through penetrant with the ends butted and held in place with two layers of aluminum foil tape. In floors, the bottom surface of the wrap strip shall extend 1/4 in. (6 mm) below the bottom surface of the floor. In wall assemblies, one wrap strip is installed on each side, with 1/4 in. (6 mm) of the wrap strip extending beyond both surfaces of the wall assembly. When the hourly rating of the assembly is 2 hours and nom 1/8 in. (3.2 mm) thick wrap strip (BLU2) is used, the wrap strip may be cut to a width of 1-1/2 in. (38 mm) for items 2A, 2B, 2C, 2D and 2E.
The F and T Ratings of the firestop system are dependent upon the type of pipe and type of wrap strip used as tabulated below:

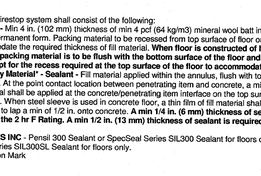
Type of Pipe	Type of Wrap Strip	F Rating Hr	T Rating Hr
A, B, C	SpecSeal RED or RED2 Wrap Strip	2	2
A, B, C	SpecSeal BLU Wrap Strip or SpecSeal BLU2 Wrap Strip	3	3
D, E, F	SpecSeal BLU Wrap Strip or SpecSeal BLU2 Wrap Strip	2	2

SPECIFIED TECHNOLOGIES INC - SpecSeal BLU Wrap Strip, SpecSeal BLU2 Wrap Strip, SpecSeal RED Wrap Strip or SpecSeal RED2 Wrap Strip
*Bearing the UL Classification Marking
+Bearing the UL Listing Mark



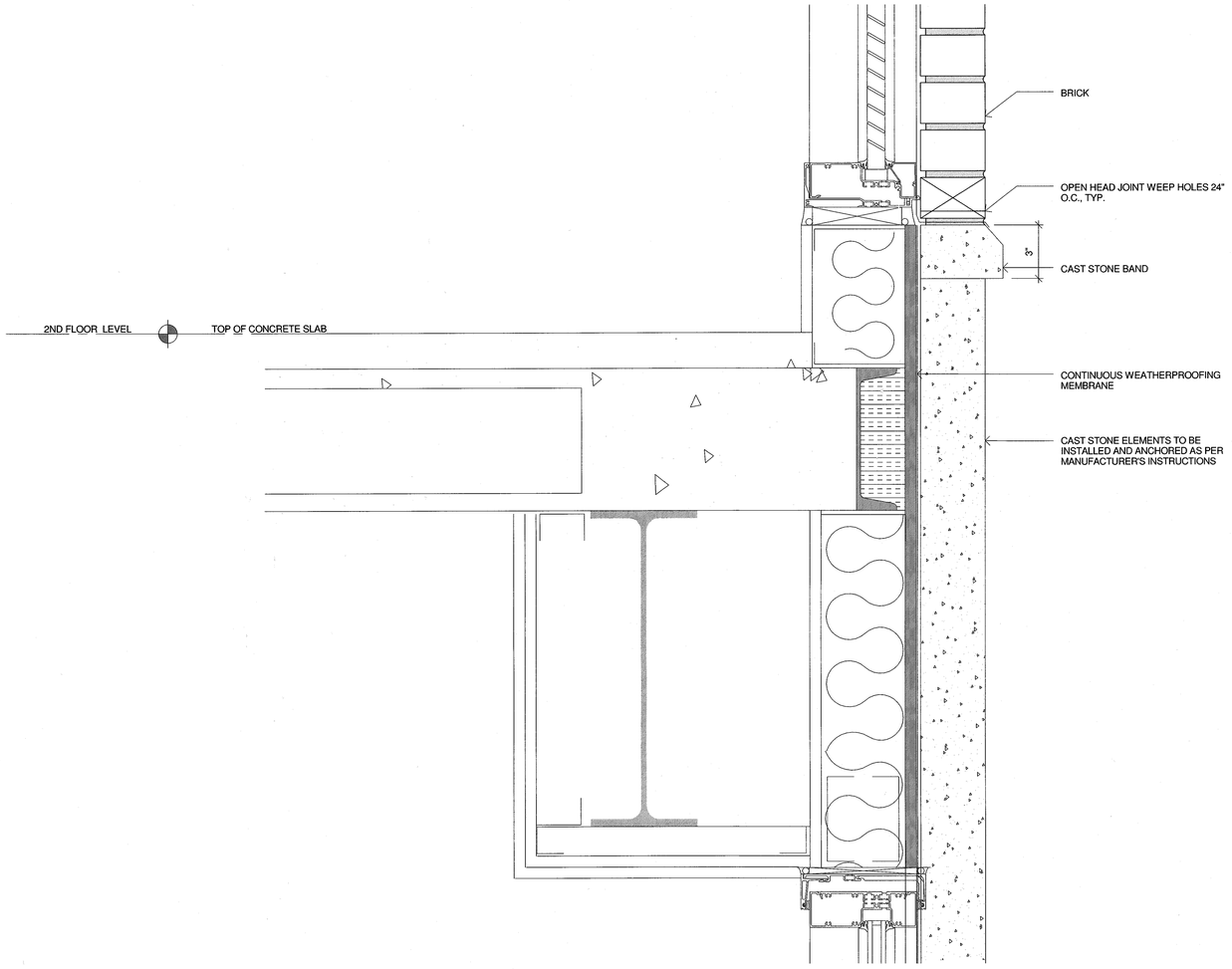
SYSTEM NO. F-A-1045
F RATING - 3 HR
T RATING - 1/4 HR

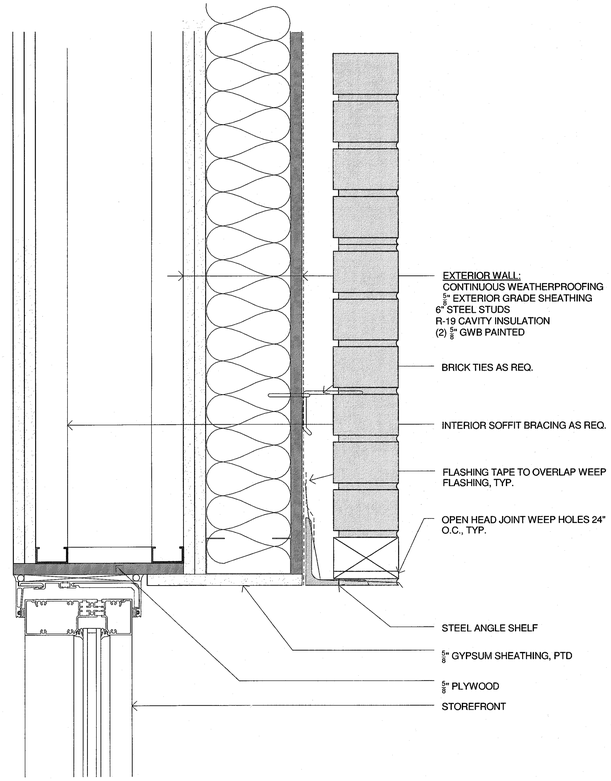
1. **Floor Assembly** - Min 4-1/2-in. thick lightweight or normal weight (100-150 pcf) concrete floor assembly. Floor may also be constructed of any min 6 in. thick hollow core Precast **Concrete Units***. Max diam of opening in floors constructed of hollow core precast concrete units is 7 in. Otherwise, max diam of opening is 2 in. larger than OD of penetrant (Item 2).
See **Precast Concrete Units** (CFTV) category in the Fire Resistance Directory for names of manufacturers.
2. **Through Penetrant** - One metallic pipe, conduit or tubing installed concentrically or eccentrically within the opening such that annular space ranges from min 0 in. (point contact) to max 2 in. Metallic pipe, conduit or tubing to be rigidly supported on both sides of floor assembly. One of the following types and sizes of metallic pipe, conduit or tubing may be used:
A. **Steel Pipe** - Nom 12 in. diam (or smaller) Schedule 5 (or heavier) steel pipe.
B. **Iron Pipe** - Nom 12 in. diam (or smaller) cast or ductile iron pipe.
C. **Conduit** - Nom 6 in. diam (or smaller) rigid steel conduit, 4 in. diam (or smaller) electrical metallic tubing (EMT) or 1 in. diam (or smaller) flexible steel or aluminum conduit.
D. **Copper Pipe or Tube** - Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing or Regular copper pipe.
3. **Firestop System** - The firestop system consists of the following items:
A. **Packing Material** - Min 3 in. thickness of min 4 pcf density mineral wool batt insulation tightly-packed into annular space. In floors constructed of hollow core precast concrete units, packing material to extend past cores. Packing material recessed from bottom surface of floor assembly as required to accommodate fill material (Item 3B).
B. **Fill, Void or Cavity Material* - Sealant** - Min 1/2 in. thickness applied within annulus, flush with bottom surface of floor. At point contact location, apply min 3/8 in. diam bead of fill material at metallic pipe/concrete interface.
SPECIFIED TECHNOLOGIES INC - SpecSeal LCI Sealant
*Bearing the UL Classification Marking

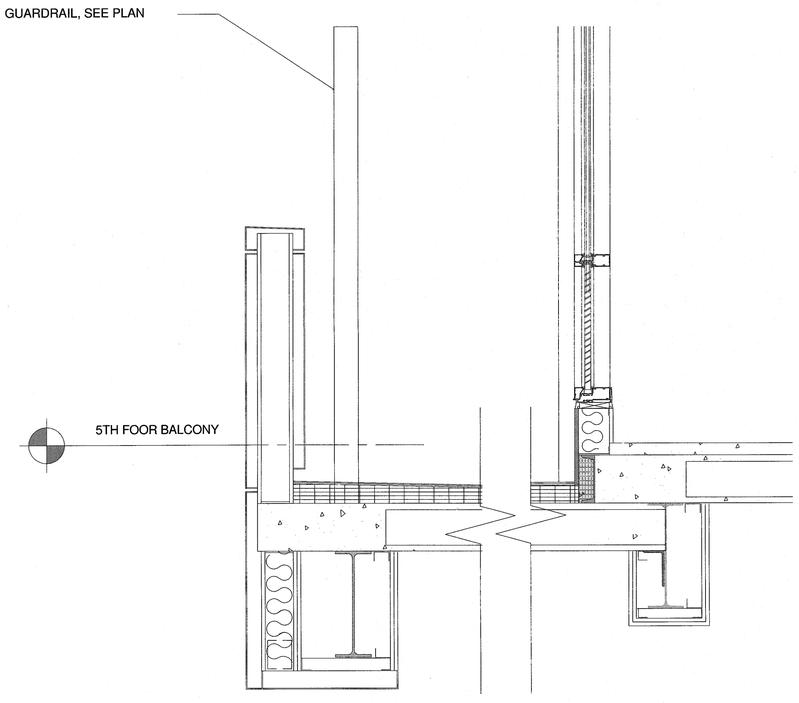


SYSTEM NO. C-AJ-1198
F RATINGS - 2 AND 3 HR (SEE ITEMS 2, 3D, 3E AND 4B)
T RATING - 0 HR
L RATING AT AMBIENT - LESS THAN 1 CFM/SQ FT
L RATING AT 400F - LESS THAN 1 CFM/SQ FT
W RATING - CLASS 1

1. **Floor or Wall Assembly -** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) concrete floor or min 5 in. (127 mm) thick reinforced lightweight or normal weight concrete wall. Wall may also be constructed of any UL Classified **Concrete Blocks***. Floor may also be constructed of any UL Classified hollow core **Precast Concrete Units***. Max diam of opening is 7 in. (178 mm) when floor is constructed of hollow-core precast concrete units. Otherwise, max diam of opening is 26 in. (660 mm).
See **Concrete Blocks** (CAZT) and **Precast Concrete Units** (CFTV) categories in the Fire Resistance Directory for names of manufacturers.
2. **Steel Sleeve -** (Optional, Not Shown) - Max 14 in. (356 mm) diam Schedule 10 (or he







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REVISION

NO.	DATE	DESCRIPTION	INT.

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FL LIC AR94034 — NH LIC 3501
GA LIC RA011484 — NY LIC 024673
IA LIC 05577 — OH LIC A-99-12444
IL LIC 001.020069 — PA LIC RA-014851-B
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NJ State Board of Architects Authorization No. 151
NJ State Board of Engineers & Land Surveyors Authorization No. GA-278177
10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number: CAPSTN-S-14-193
Scale: AS NOTED
Drawn By:
Approved By: MBJ

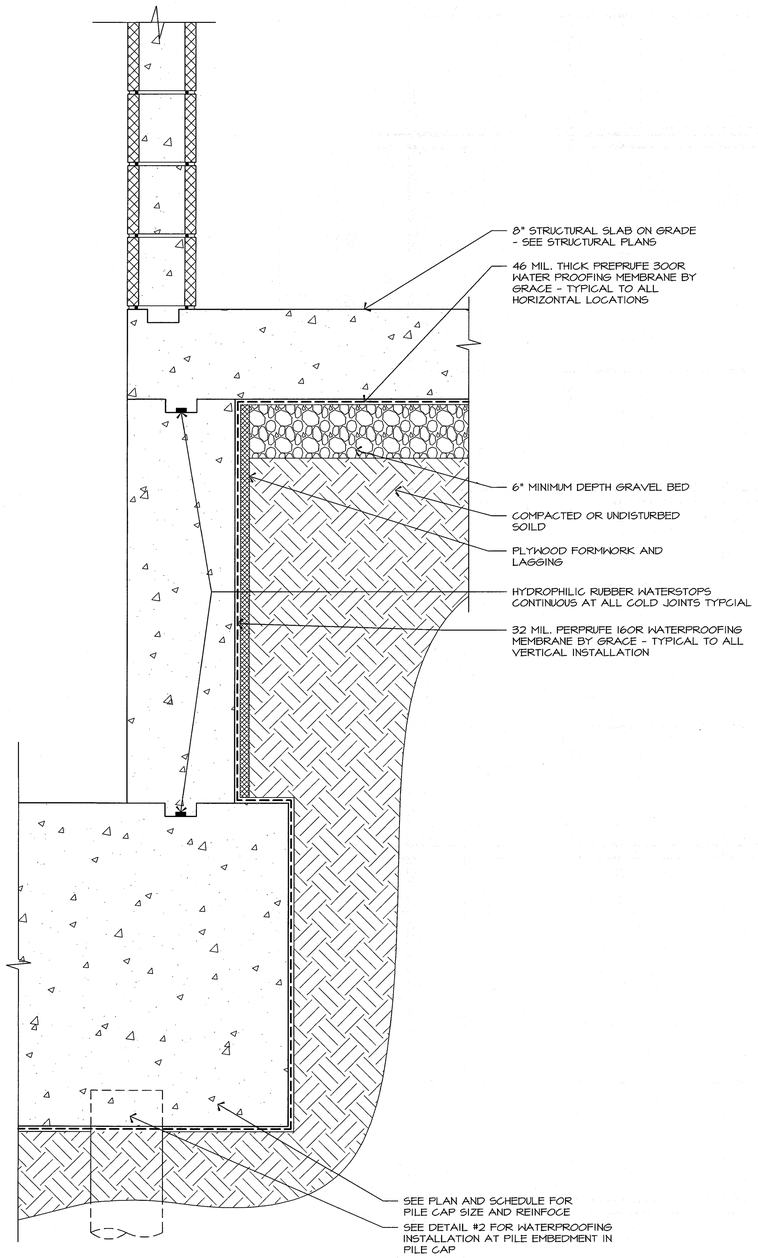
Drawing Name:
EXTERIOR DETAILS

Drawing Number:
A-502.00

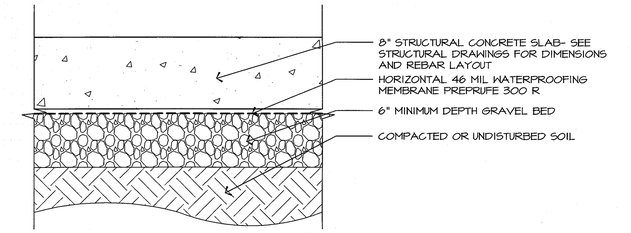
SHEET44of 102

Initial Date:

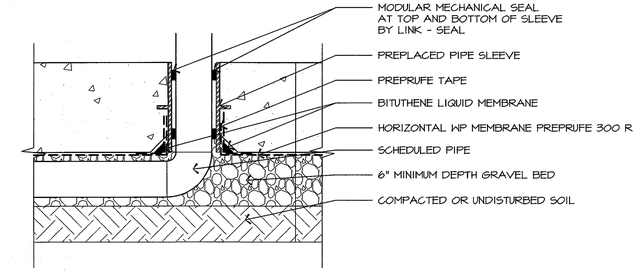
REGISTERED ARCHITECT MATTHEW B. JARMEL 22473 STATE OF NEW YORK



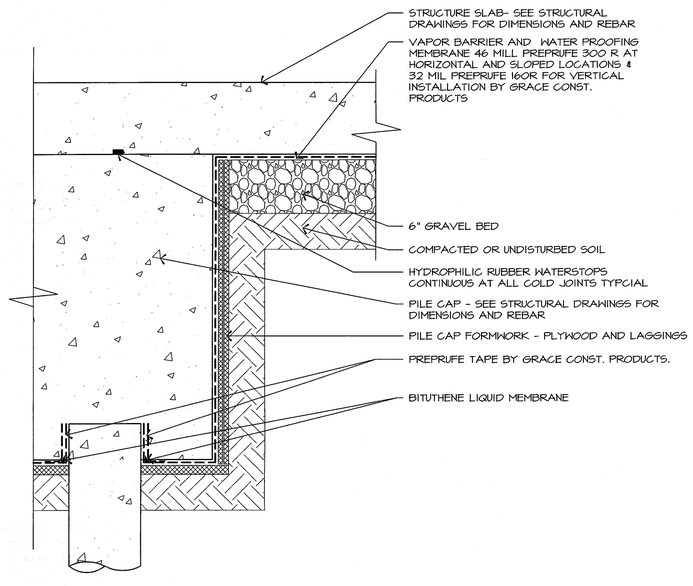
3 TYP. PIT WATERPROOFING DETAIL
SCALE : 1-1/2" = 1'-0"



4 STRUCTURAL SLAB AT GRADE - TYP.
SCALE : 1-1/2" = 1'-0"



1 SLAB PENETRATION AT GRADE - TYP.
SCALE : 1-1/2" = 1'-0"



2 PILE CAP WATERPROOFING - TYP.
SCALE : 1-1/2" = 1'-0"

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Architecture
Engineering
Interior Design
Implementation Services

ISSUE

NO.	DATE	DESCRIPTION	INT.
01	03.19.15	FILING & PRICING	MBJ

REVISION

NO.	DATE	DESCRIPTION	INT.

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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA27817
10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
DJP	MJV

Drawing Name:
FOUNDATION WATERPROOFING DETAILS

Drawing Number:
A-503.00

Initial Date:

REGISTERED ARCHITECT MATTHEW K. JARMEL LICENSE 024673 STATE OF NEW YORK

Door Schedule

Door Number	Level	SIZE Width	SIZE Height	Thickness	FRAME & PANEL Material / Type	Finish	Fire Rating	Function	Hardware Set	Comments
100	1st Floor	5' - 6"	8' - 0"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	MAIN APARTMENT ENTRY
100a	1st Floor	5' - 6"	7' - 0"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	MAIN APARTMENT ENTRY
101	1st Floor	3' - 0"	7' - 8"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
102	1st Floor	3' - 0"	7' - 8"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
104	1st Floor	3' - 0"	7' - 8"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT CORRIDOR
104	1st Floor	3' - 0"	7' - 8"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	UTILITY ROOM
105	1st Floor	2' - 8"	7' - 0"	0' - 2"	HOLLOW METAL	PAINT	NON-RATED	Interior	#3	LAUNDRY
106	1st Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#6	MECHANICAL ROOM
107	1st Floor	7' - 0"	6' - 6"	0' - 2"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	UTILITY ROOM
108	1st Floor	7' - 0"	6' - 6"	0' - 2"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	UTILITY ROOM
109	1st Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#6	TRASH ROOM
110	1st Floor	3' - 0"	7' - 8"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	H/C TOILET
111	1st Floor	2' - 8"	7' - 0"	0' - 2"	HOLLOW METAL	PAINT	NON-RATED	Interior	#3	LAUNDRY
112	1st Floor	3' - 0"	7' - 8"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT DOOR
113	1st Floor	8' - 6"	7' - 0"	0' - 2 1/2"	ROLL-UP DOOR	PAINT	NON-RATED	Exterior	Manuf's	GARAGE ENTRY DOOR
114	1st Floor	3' - 0"	7' - 0"	0' - 1 1/2"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET
A	2nd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	UNIT ENTRY
A	2nd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	UNIT ENTRY
A	2nd Floor	3' - 0"	7' - 0"	0' - 0"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	UNIT ENTRY
A	2nd Floor	3' - 0"	7' - 0"	0' - 0"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	UNIT ENTRY
C	2nd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2	TOILET
C	2nd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2	TOILET
C	2nd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2	TOILET
C	2nd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2	TOILET
D	2nd Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	2nd Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	2nd Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	2nd Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
H	2nd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	2nd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	TRASH ROOM
H	2nd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
A	3rd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	UNIT ENTRY
A	3rd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#2a	UNIT ENTRY
A	3rd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	UNIT ENTRY
A	3rd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#2a	UNIT ENTRY
C	3rd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2	TOILET
C	3rd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2	TOILET
C	3rd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2	TOILET
C	3rd Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2	TOILET
D	3rd Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	3rd Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	3rd Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	3rd Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
H	3rd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	3rd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	3rd Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	TRASH ROOM
A	4th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	APARTMENT ENTRY
A	4th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	APARTMENT ENTRY
A	4th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	APARTMENT ENTRY
A	4th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#1	APARTMENT ENTRY
B	4th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BEDROOM
B	4th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BEDROOM
B	4th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BEDROOM
B	4th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BEDROOM
C	4th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C	4th Floor	2' - 10"	7' - 2"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C	4th Floor	2' - 10"	7' - 2"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C	4th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C-X	4th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
C-X	4th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
C-X	4th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
C-X	4th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
D	4th Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	4th Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	4th Floor	5' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	4th Floor	5' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
E	4th Floor	1' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4	CLOSET
E	4th Floor	1' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4	CLOSET
E	4th Floor	2' - 4"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET
F	4th Floor	1' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4	CLOSET
F	4th Floor	1' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4	CLOSET
F	4th Floor	2' - 4"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET
G	4th Floor	2' - 8"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
G	4th Floor	2' - 9"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
G	4th Floor	2' - 8"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
G	4th Floor	2' - 9"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
H	4th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	4th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	4th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	TRASH ROOM
A	5th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	1 1/2 HR FPSC	Interior	#1	APARTMENT ENTRY
A	5th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	1 1/2 HR FPSC	Interior	#1	APARTMENT ENTRY
A	5th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	1 1/2 HR FPSC	Interior	#1	APARTMENT ENTRY
A	5th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	1 1/2 HR FPSC	Interior	#1	APARTMENT ENTRY
B	5th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BEDROOM
B	5th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BEDROOM
B	5th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BEDROOM
B	5th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BEDROOM
C	5th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C	5th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM

Door Schedule

Door Number	Level	SIZE Width	SIZE Height	Thickness	FRAME & PANEL Material / Type	Finish	Fire Rating	Function	Hardware Set	Comments
C	5th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C	5th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C-X	5th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
C-X	5th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
C-X	5th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
C-X	5th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
D	5th Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	5th Floor	5' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	5th Floor	5' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	5th Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
E	5th Floor	2' - 6"	7' - 0"		WOOD	PAINT		Interior		CLOSET
E	5th Floor	1' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4	CLOSET
E	5th Floor	1' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4	CLOSET
E	5th Floor	1' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4	CLOSET
F	5th Floor	1' - 10"	7' - 0"	0' - 1 3/4"			NON-RATED	Interior	#4	CLOSET
F	5th Floor	2' - 4"	7' - 0"	0' - 1 3/4"			NON-RATED	Interior	#4A	CLOSET
G	5th Floor	2' - 8"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	BALCONY
G	5th Floor	2' - 8"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	BALCONY
G	5th Floor	2' - 6 1/2"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	BALCONY
G	5th Floor	2' - 8"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	BALCONY
H	5th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	5th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	5th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	TRASH ROOM
A	6th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT		Interior		APARTMENT ENTRY
A	6th Floor	3' - 0"	7' - 8"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	APARTMENT ENTRY
A	6th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT		Interior		APARTMENT ENTRY
A	6th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT		Interior		APARTMENT ENTRY
B	6th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	1 1/2 HR FPSC	Interior	#2a	BEDROOM
B	6th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	1 1/2 HR FPSC	Interior	#2a	BEDROOM
C	6th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C	6th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C	6th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C	6th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#2a	BATHROOM
C-X	6th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
C-X	6th Floor	2' - 10"	7' - 0"	0' - 0"				Interior		ADAPTABLE C-TYPE DOOR
D	6th Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
D	6th Floor	3' - 4"	7' - 0"	0' - 1 3/4"	WOOD	PAINT		Interior	#4A	CLOSET - DOUBLE
D	6th Floor	4' - 0"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#4A	CLOSET - DOUBLE
E	6th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#3	CLOSET
E	6th Floor	2' - 10"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#3	CLOSET
E	6th Floor	2' - 8"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#3	CLOSET
F	6th Floor	1' - 6"	7' - 0"	0' - 1 3/4"	WOOD	PAINT	NON-RATED	Interior	#3	CLOSET
G	6th Floor	2' - 8"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
G	6th Floor	2' - 8 1/2"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
G	6th Floor	2' - 8"	6' - 9 1/2"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
G	6th Floor	2' - 8"	6' - 9 1/2"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
G	6th Floor	2' - 8"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
G	6th Floor	2' - 6"	6' - 9"	0' - 2"	ALUM FAME GLASS PANEL	ANODIZED	NON-RATED	Exterior	Manuf's	TERRACE
H	6th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	6th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	6th Floor	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	TRASH ROOM
I	6th Floor	2' - 6"	6' - 8"	0' - 1 1/2"	WOOD	PAINT	NON-RATED	Interior	#3	CLOSET
I	6th Floor	2' - 6"	6' - 8"	0' - 1 1/2"	WOOD	PAINT	NON-RATED	Interior	#3	CLOSET
H	ROOF	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	ROOF	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	EXIT STAIRCASE
H	ROOF	3' - 0"	7' - 0"	0' - 1 3/4"	HOLLOW METAL	PAINT	1 1/2 HR FPSC	Interior	#5	TRASH ROOM

HARDWARE SET #1: APT ENTRANCE DOORS (RATED DOOR)
1-1/2 PAIR SPRING HINGES
1- EA. LOCKSET LEVER
1- EA. DEADBOLT w/ HEAVY-DUTY STRIKE PLATE
1- EA. FLOOR STOP
1- EA. DOOR GUARD
1- EA. VIEWER
1- EA. SWEEP
1- EA. KICK PLATE
3- EA. SILENCERS

HARDWARE SET #2: TOILETS AND BATHROOMS
1-1/2 PAIR HINGES
1- EA. PRIVACY SET LEVER
1- EA. BASE STOP
3- EA. SILENCERS

HARDWARE SET #2A: BATHROOM DOOR
1- ALUMINUM I-BEAM TRACK
1- 4-WHEEL BALL BEARING DOOR HANGERS
1- POCKET DOOR LATCH PRIVACY LOCK SET
1- DOOR FLUSH PULL
1- DOOR MOUNT RUBBER STOP

HARDWARE SET #3: BEDROOMS
1-1/2 PAIR. HINGES
1- EA. PRIVACY SET LEVER
1- EA. BASE STOP
3- EA. SILENCERS

HARDWARE SET #3A: BEDROOMS / LIVINGROOM (DOUBLE)
3 PAIR. HINGES
1- EA. PASSAGE SET LEVER
2 BASE STOPS
SILENCERS

HARDWARE SET #4: APARTMENT CLOSET (SINGLE)
1-1/2 PAIR HINGES
1- EA. PASSAGE SET LEVER
AS REQ. - BASE STOP

HARDWARE SET #4A: APARTMENT CLOSET (DOUBLE)
3 PAIR HINGES
1- EA. PASSAGE SET LEVER
AS REQ. - BASE STOP

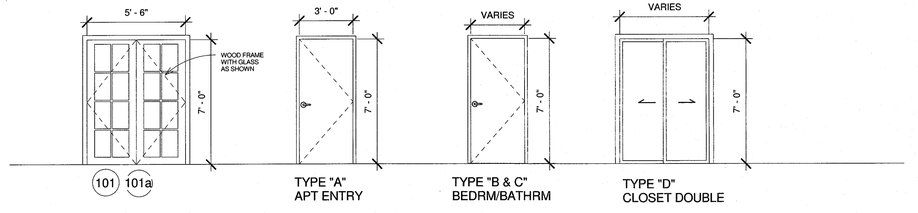
HARDWARE SET #5: FIRE STAIR DOORS (RATED DOOR)
1-1/2 PAIR SPRING HINGES
1- EA. PULL SIDE CLOSER
1- EA. RATED PASSAGE SET
1- EA. FLOOR STOP
1- EA. DOOR GUARD
3- EA. SILENCERS

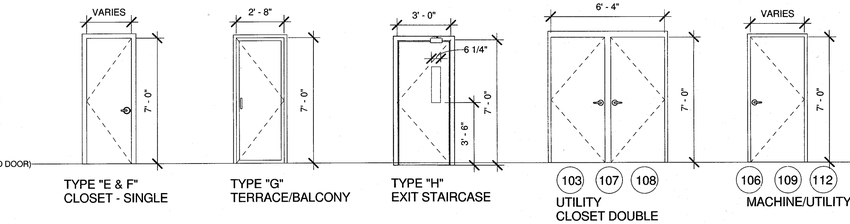
HARDWARE SET #6: MECH AND UTILITY ROOMS (RATED DOOR)
1-1/2 PAIR SPRING HINGES
1- EA. STOREROOM LOCKSET
1- EA. FLOOR STOP
3- EA. SILENCERS

HARDWARE SET #7: EXIT DOORS TO EXTERIOR
1-1/2 PAIR- EA. HINGES
1- EA. EMERGENCY EXIT LOCKSET
ELECTRICALLY UNLOCKED FAIL SECURE
1- EA. CLOSER
1- EA. FLOOR STOP
1- EA. PERIMETER SEAL
1- EA. SWEEP

HARDWARE SET #8 AMENITY ROOMS
3 PAIR HINGES
1- EA. CLOSER
1- EA. LOCKSET LEVER
2 FLOOR STOP
2 DOOR GUARD
6- EA. SILENCERS

HARDWARE TYPES:





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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA 278177

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
	MBJ

Drawing Name:
Door Schedule

Drawing Number:
A-600.00

SHEET45of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL STATE OF NEW YORK

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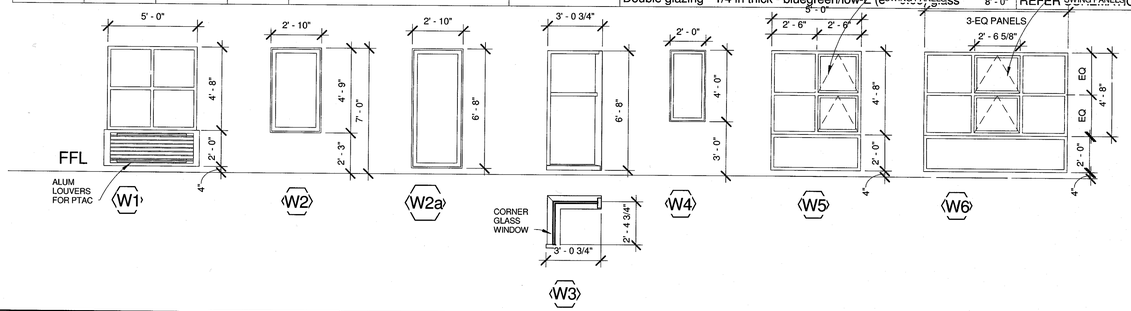
Window Schedule

Level	Mark	Width	Height	Frame Material	Glass U-Factor	Glazing	Type Comments
1st Floor	W12				Fixed 0.48 to 0.24		2-1/4" Thermal Heavy Commercial Window and Architectural Window
1st Floor	W16	5' - 0"	6' - 8"				FIXED PANEL WINDOW
1st Floor	W17	5' - 0"	6' - 8"				FIXED PANEL WINDOW
1st Floor	W18	5' - 0"	6' - 8"				FIXED PANEL WINDOW
2nd Floor	W1	5' - 0"	6' - 8"	Metal - Aluminum - Anodized - Clear		Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W1	5' - 0"	6' - 8"	Metal - Aluminum - Anodized - Clear		Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W2	2' - 10"	4' - 9"	Metal - Aluminum - Anodized - Clear	Fixed 0.48 to 0.24	Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W2	2' - 10"	4' - 9"		Fixed 0.48 to 0.24	Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W2	2' - 10"	6' - 8"		Fixed 0.48 to 0.24	Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
2nd Floor	W2	2' - 10"	6' - 8"		Fixed 0.48 to 0.24	Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W2	2' - 10"	6' - 8"		Fixed 0.48 to 0.24	Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W2	2' - 10"	6' - 8"		Fixed 0.48 to 0.24	Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W2	2' - 10"	6' - 8"		Fixed 0.48 to 0.24	Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
3rd Floor	W19	2' - 10"	6' - 8"		Fixed 0.48 to 0.24	Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
4th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
4th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
4th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
4th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
4th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
4th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
4th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
4th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
4th Floor	W3					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW
4th Floor	W3					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW
4th Floor	W3					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW
4th Floor	W3					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW
4th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
4th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
4th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
4th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
5th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
5th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
5th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
5th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
5th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
5th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
5th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
5th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
5th Floor	W3					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW
5th Floor	W3					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW
5th Floor	W3					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW
5th Floor	W3					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW
5th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
5th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
5th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
5th Floor	W5	5' - 0"	6' - 8"	Metal - Aluminum - Anodized - Clear			FIXED PANEL WINDOW
6th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
6th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
6th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
6th Floor	W1	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
6th Floor	W4	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
6th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
6th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
6th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
6th Floor	W5	5' - 0"	6' - 8"				FIXED PANEL WINDOW
6th Floor	W6					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW
6th Floor	W7	5' - 0"	6' - 8"			Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	
6th Floor	W8					Double glazing - 1/4 in thick - bluegreen/low-E (e = 0.05) glass	REFER SCHEMATIC DRAWING BELOW



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Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	Approved By: MBJ

Drawing Name:

WINDOW SCHEDULE

Drawing Number:

A-700.00

SHEET46of 102

Initial Date:

REGISTERED ARCHITECT — MATTHEW B. JARMEL — STATE OF NEW YORK

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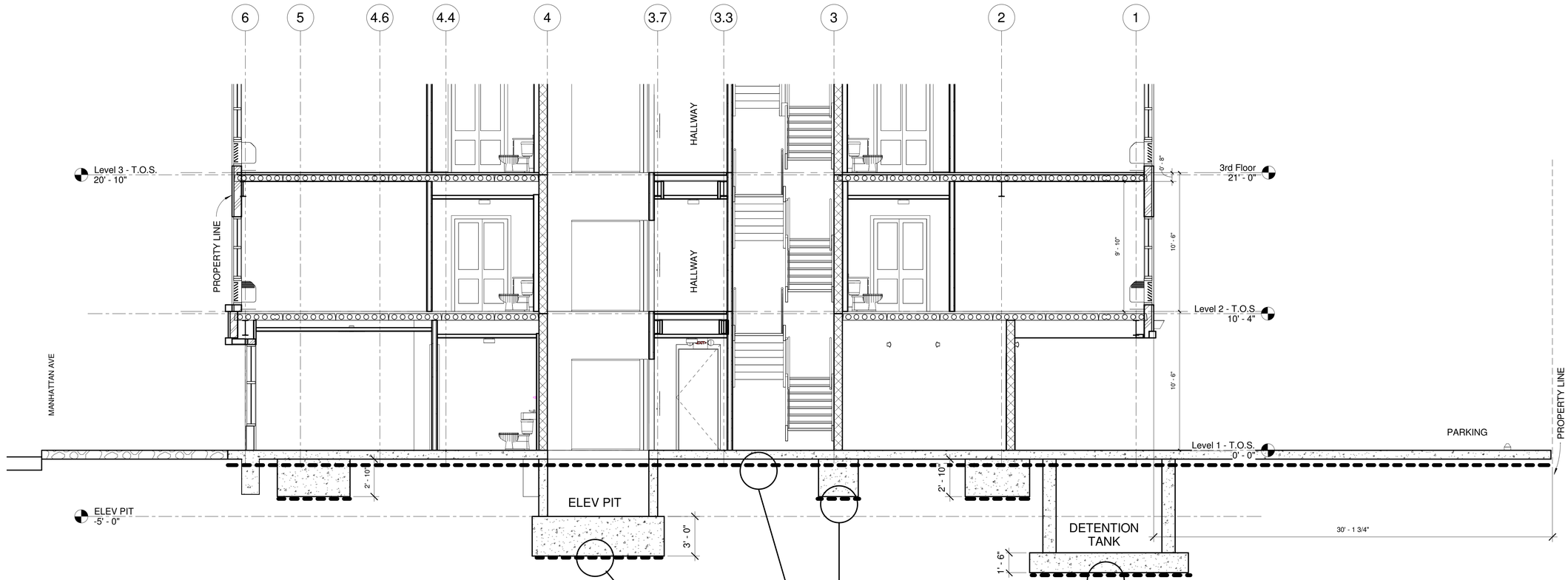
Appendix 8
Composite Cover Diagram



1 BUILDING SECTION

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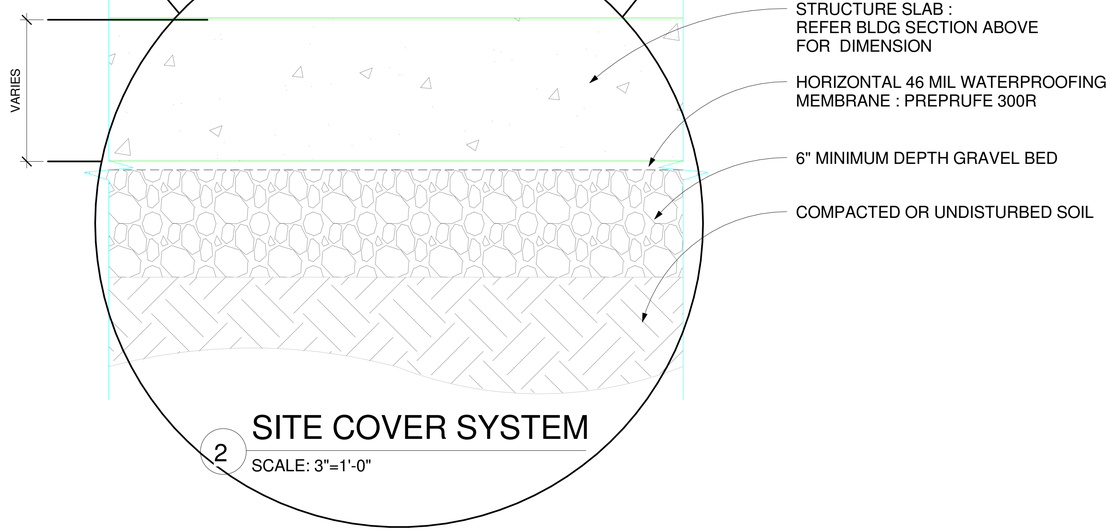

2 SITE COVER SYSTEM

SCALE: 3"=1'-0"

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387 MANHATTAN AVE
BROOKLYN, NEW YORK

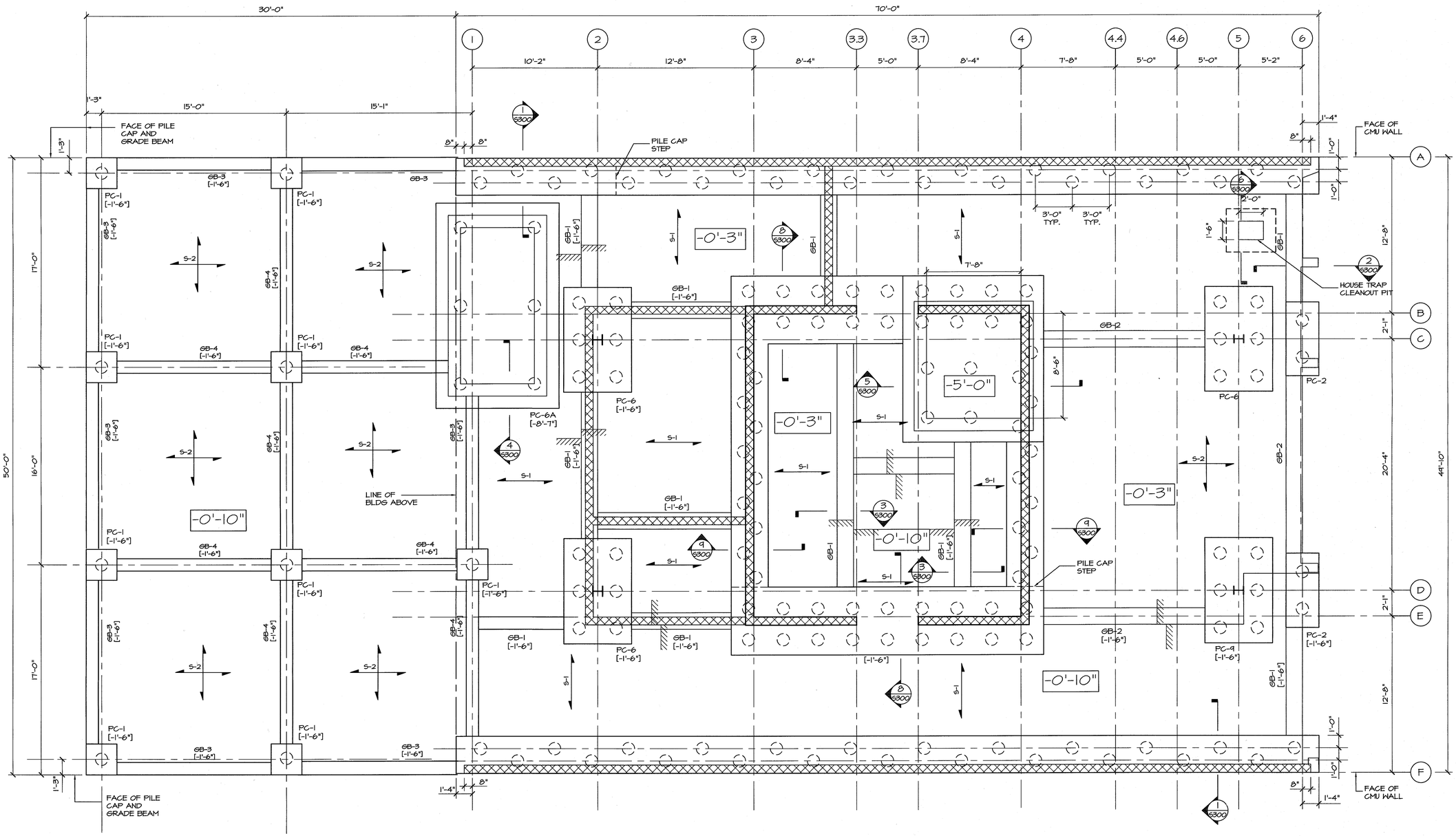
Project Number:	Scale:
CAPSTN-S-14-193	AS SHOWN
Drawn By: EE	**Approved By:** MJV

Drawing Name:
SITE COMPOSITE COVER SYSTEM

REGISTERED ARCHITECT — MATTHEW B. JARMEL — No. 024673 — STATE OF NEW YORK

Drawing Number:
A-504.00

Initial Date:



FOUNDATION PLAN

SCALE 1/4" = 1'-0"

NOTES:

1. TOP OF FINISHED FLOOR IS SET AS DATUM ELEVATION 0'-0" AND IS ACTUAL ELEVATION 12.00'.
2. TOP OF SLAB ELEVATION IS NOTED THUS [-X'-X"] ON PLAN AND IS REFERENCED FROM THE DATUM ELEVATION.
3. ⟷ INDICATES SPAN OF MAIN REINFORCING IN SLAB. SEE SLAB DETAILS.
4. SX INDICATES SLAB TYPE. SLAB CONSTRUCTION SHALL BE 8" THICK REINFORCED CONCRETE SPANNING BETWEEN PILE CAPS AND GRADE BEAMS. REFER TO SLAB DETAILS ON S-300 FOR REQUIRED REINFORCING
5. TOP OF PILE CAP AND GRADE BEAM ELEVATIONS SHALL BE -0'-11" UNLESS NOTED THUS [-X'-X"] ON PLAN AND IS REFERENCED FROM THE DATUM ELEVATION.
6. PCX - INDICATES PILE CAP TYPE. SEE PILE CAP DETAILS FOR SIZE AND REINFORCING
7. GBX - INDICATES GRADE BEAM TYPE. SEE GRADE BEAM SCHEDULE FOR SIZE AND REINFORCING.
8. ALL COLUMN PILE CAPS SHALL BE CENTERED UNDER COLUMN CENTER LINES UNLESS OTHERWISE NOTED.
9. SEE ARCHITECTURAL DRAWINGS FOR SCHEDULE OR FINISHES ON ALL EXPOSED CONCRETE SURFACES.
10. FOR GENERAL NOTES, SEE DRAWINGS S-200.
11. FOR COLUMN SCHEDULE, SEE DRAWING S-202.

GRADE BEAM SCHEDULE

BEAM MARK	WIDTH (IN)	DEPTH (IN)	LONGITUDINAL REINFORCING			STIRRUPS		REMARKS
			TOP	BOTT.	EA. SIDE	SIZE	SPACING	
GB-1	16"	32"	2-#5	2-#5	2-#5			
GB-2	16"	32"	2-#5	3-#7	2-#5			
GB-3	12"	24"	2-#5	2-#7	2-#5			
GB-4	12"	24"	2-#5	3-#8	2-#5			

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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GAC078777

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

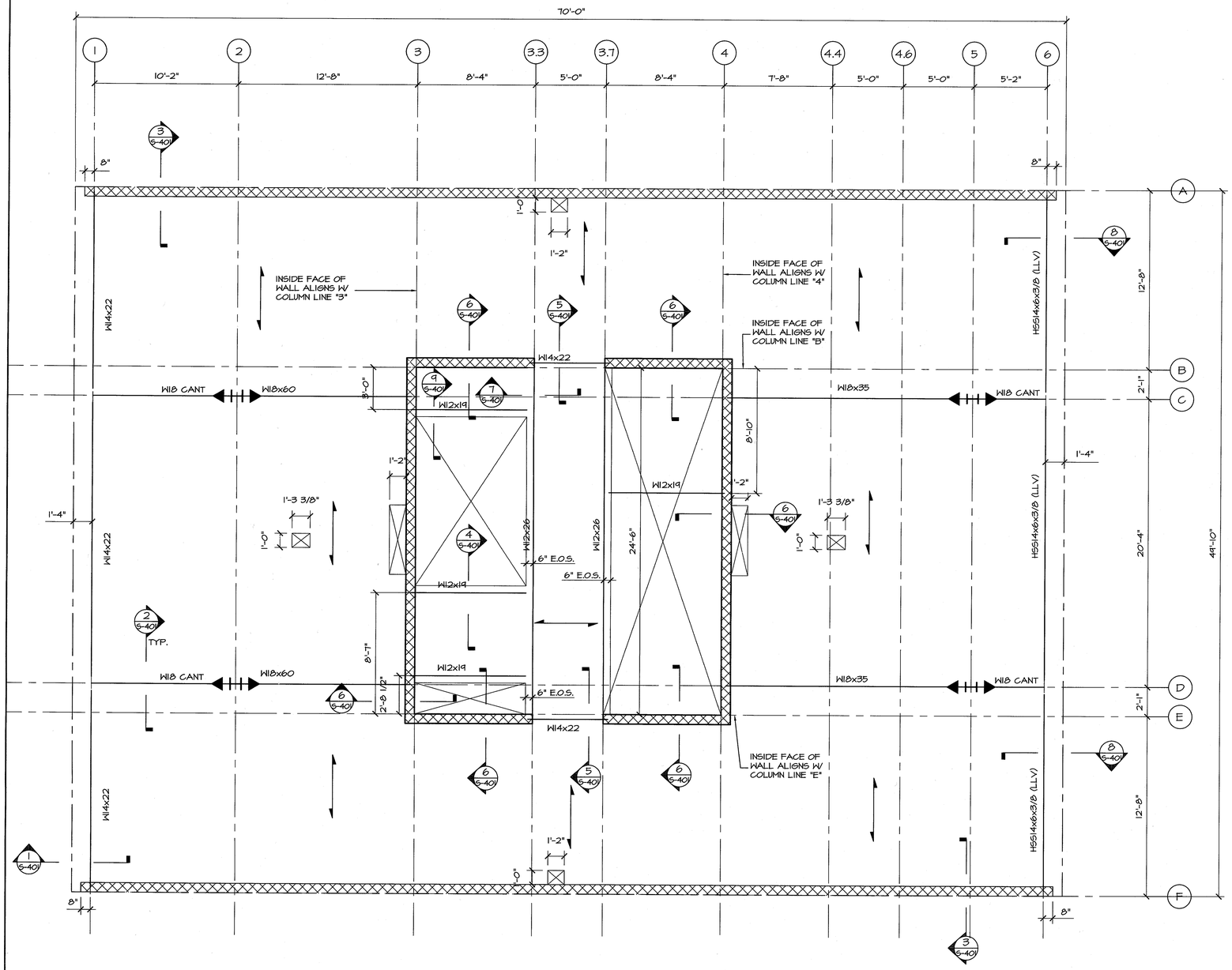
Project Number: CAPSTN-S-14-193
Scale: AS NOTED
Drawn By: SC
Approved By: RAB

Drawing Name:
FOUNDATION PLAN

Drawing Number:
S-101
SHEET9of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL STATE OF NEW YORK



SECOND FLOOR FRAMING PLAN

SCALE 1/4" = 1'-0"

NOTES:

1. FLOOR CONSTRUCTION SHALL BE 6" HOLLOWCORE SLAB W/ 2" NORMAL WEIGHT CONCRETE TOPPING.
2. ——► INDICATES SPAN DIRECTION OF SLAB.
3. TOP OF CONCRETE IS AT 10'-6" UNLESS NOTED THUS [X'-X"] ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
4. TOP OF STEEL ELEVATION IS AT BOTTOM OF SLAB UNLESS NOTED THUS (+X'-X") ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
5. ▶—┤ INDICATES BEAM TO COLUMN AND BEAM TO BEAM MOMENT CONNECTION. SEE TYPICAL DETAILS FOR MORE INFORMATION.
6. SEE DRAWING S-200 FOR GENERAL NOTES AND TYPICAL DETAILS.
7. COORDINATE SIZE AND LOCATION OF ALL FLOOR PENETRATIONS AND SHAFTS WITH ARCHITECTURAL AND MEP DRAWINGS. SEE TYPICAL DETAILS FOR REQUIRED FRAMING AROUND OPENINGS.

SECOND FLOOR LOAD SCHEDULE	
DEAD LOAD:	
6" HOLLOWCORE SLAB W/2" TOPPING	74 PSF
CEILING	3 PSF
MEP	5 PSF
SPRINKLER/MISC	7 PSF
TOTAL DEAD LOAD	89 PSF
LIVE LOAD	100 PSF
TOTAL LOAD	189 PSF

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NO.	DATE	DESCRIPTION	INT.
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Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By: SC	**Approved By:** RAB

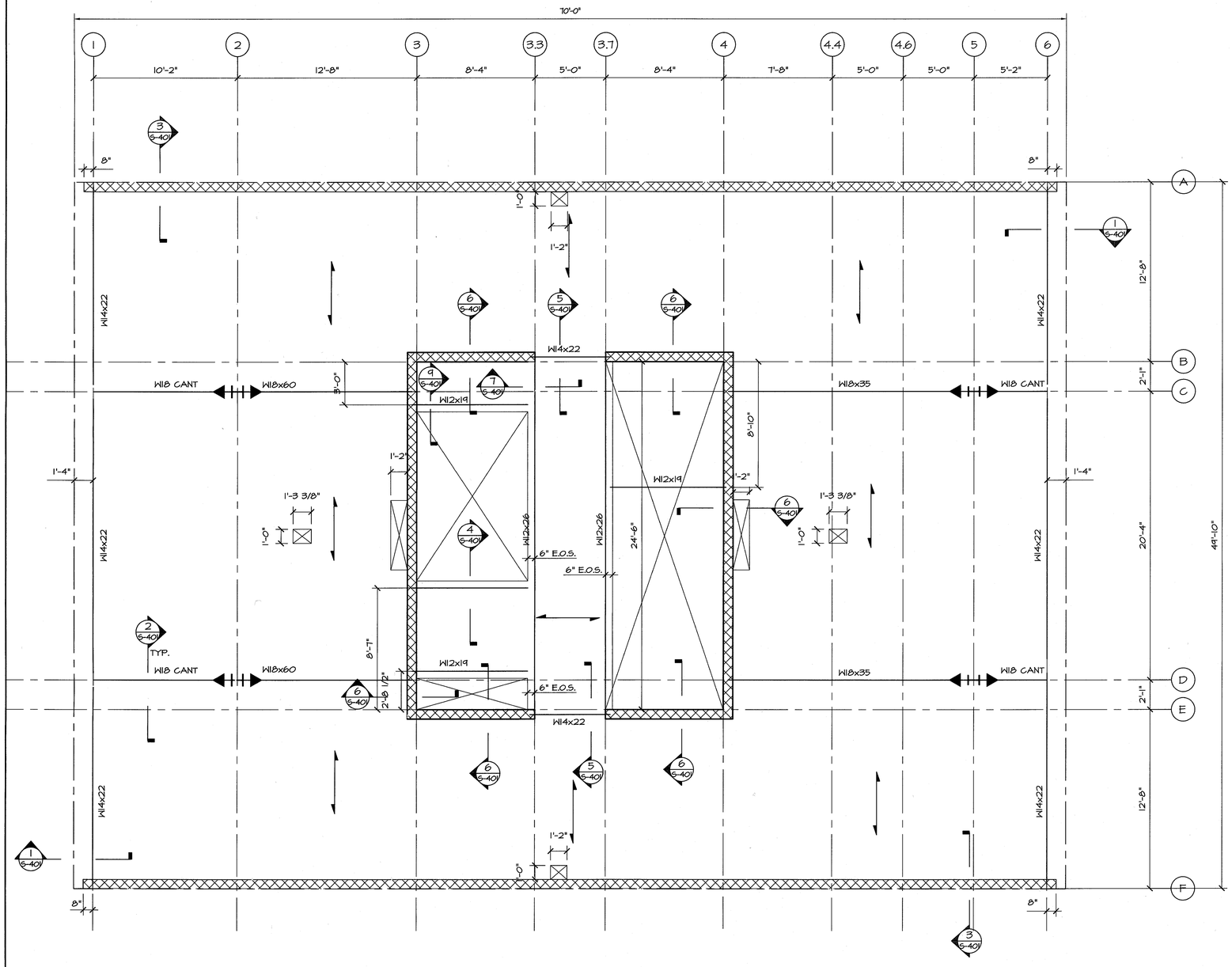
Drawing Name:
SECOND FLOOR FRAMING PLAN

Drawing Number:
S-102

SHEET10of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL STATE OF NEW YORK



THIRD FLOOR FRAMING PLAN

SCALE 1/4" = 1'-0"

NOTES:

1. FLOOR CONSTRUCTION SHALL BE 6" HOLLOWCORE SLAB W/ 2" NORMAL WEIGHT CONCRETE TOPPING. CONCRETE TOPPING IS NONCOMPOSITE.
2. ←→ INDICATES SPAN DIRECTION OF SLAB.
3. TOP OF CONCRETE IS AT 21'-0" UNLESS NOTED THUS [X'-X"] ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
4. TOP OF STEEL ELEVATION IS AT BOTTOM OF SLAB UNLESS NOTED THUS (+X'-X") ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
5. ▶—┤ INDICATES BEAM TO COLUMN AND BEAM TO BEAM MOMENT CONNECTION. SEE TYPICAL DETAILS FOR MORE INFORMATION.
6. SEE DRAWING S-200 FOR GENERAL NOTES AND TYPICAL DETAILS.
7. COORDINATE SIZE AND LOCATION OF ALL FLOOR PENETRATIONS AND SHAFTS WITH ARCHITECTURAL AND MEP DRAWINGS. SEE TYPICAL DETAILS FOR REQUIRED FRAMING AROUND OPENINGS.

THIRD FLOOR LOAD SCHEDULE	
DEAD LOAD:	
6" HOLLOWCORE SLAB W/2" TOPPING	74 PSF
CEILING	3 PSF
MEP	5 PSF
SPRINKLER/MISC	7 PSF
TOTAL DEAD LOAD	89 PSF
LIVE LOAD	100 PSF
TOTAL LOAD	189 PSF

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PRINCIPALS:
MATTHEW R. JARMEL AIA, MBA
AZ LIC 48159 — NJ LIC A10-12787
CO LIC ARC-401483 — MI LIC 1301051189
DC LIC ARC-101849 — MN LIC 46404
DE LIC S5-00007256 — NC LIC 10120
FL LIC AR94034 — NH LIC 3501
GA LIC RA011484 — NY LIC 024673
IA LIC 05577 — OH LIC A-99-12444
IL LIC 001.020069 — PA LIC RA-014651-B
MA LIC AR10286 — TN LIC 103850
MD LIC 12662 — TX LIC 20992
VA LIC 0401 014089
VT LIC 2453
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CT LIC 08522 — NJ LIC 21A100794700
NJ LIC PP LIC 33L100243100
RICHARD A. JARMEL, PE
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FL LIC 70134 — MN LIC 47482
MI LIC 6201052339 — NY LIC 0738898-1
DE LIC 18754 — PA LIC PE070600
VT LIC 88498 — MA LIC 50445
ASSOCIATES:
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DAVID L. LESESNE, RA — NJ LIC GE45511
NY LIC 024719
MICHAEL J. VORLAND, RA — NY LIC 036993
GERARD P. GESARIO, PE — NY LIC GE038235
JOHN TUDOR, RA — NY LIC 023617
NJ LIC 21A1012660
FREDRICK KINCAID, RA — NJ LIC 21A1018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA-278177
10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
SC	RAB

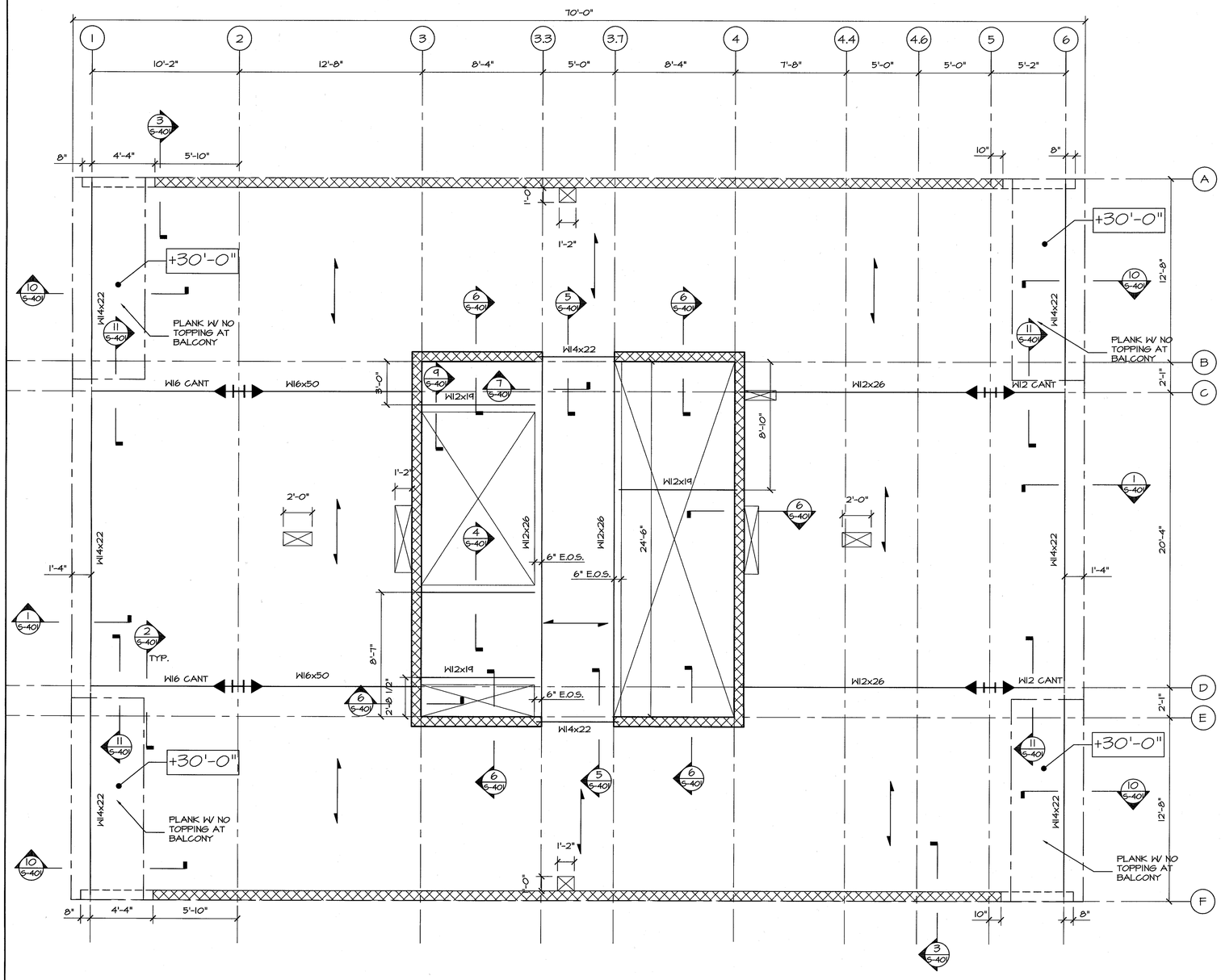
Drawing Name:
THIRD FLOOR FRAMING PLAN

Drawing Number:
S-103

SHEET11of 102

Initial Date:

REGISTERED ARCHITECT MATTHEW R. JARMEL 024673 STATE OF NEW YORK



FOURTH FLOOR FRAMING PLAN

SCALE 1/4" = 1'-0"

NOTES:

1. FLOOR CONSTRUCTION SHALL BE 6" HOLLOWCORE SLAB W/ 2" NORMAL WEIGHT CONCRETE TOPPING. CONCRETE TOPPING IS NONCOMPOSITE.
2. ⟷ INDICATES SPAN DIRECTION OF SLAB.
3. TOP OF CONCRETE IS AT 30'-6" UNLESS NOTED THUS [X'-X"] ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
4. TOP OF STEEL ELEVATION IS AT BOTTOM OF SLAB UNLESS NOTED THUS (+x'-x") ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
5. ▶┤ INDICATES BEAM TO COLUMN AND BEAM TO BEAM MOMENT CONNECTION. SEE TYPICAL DETAILS FOR MORE INFORMATION.
6. SEE DRAWING S-200 FOR GENERAL NOTES AND TYPICAL DETAILS.
7. COORDINATE SIZE AND LOCATION OF ALL FLOOR PENETRATIONS AND SHAFTS WITH ARCHITECTURAL AND MEP DRAWINGS. SEE TYPICAL DETAILS FOR REQUIRED FRAMING AROUND OPENINGS.

FOURTH FLOOR LOAD SCHEDULE

DEAD LOAD:	
6" HOLLOWCORE SLAB W/2" TOPPING	74 PSF
CEILING	3 PSF
MEP	5 PSF
SPRINKLER/MISC	7 PSF
TOTAL DEAD LOAD	89 PSF
LIVE LOAD	40 PSF
TOTAL LOAD	129 PSF

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Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-5-14-193	AS NOTED
Drawn By:	**Approved By:**
SC	RAB

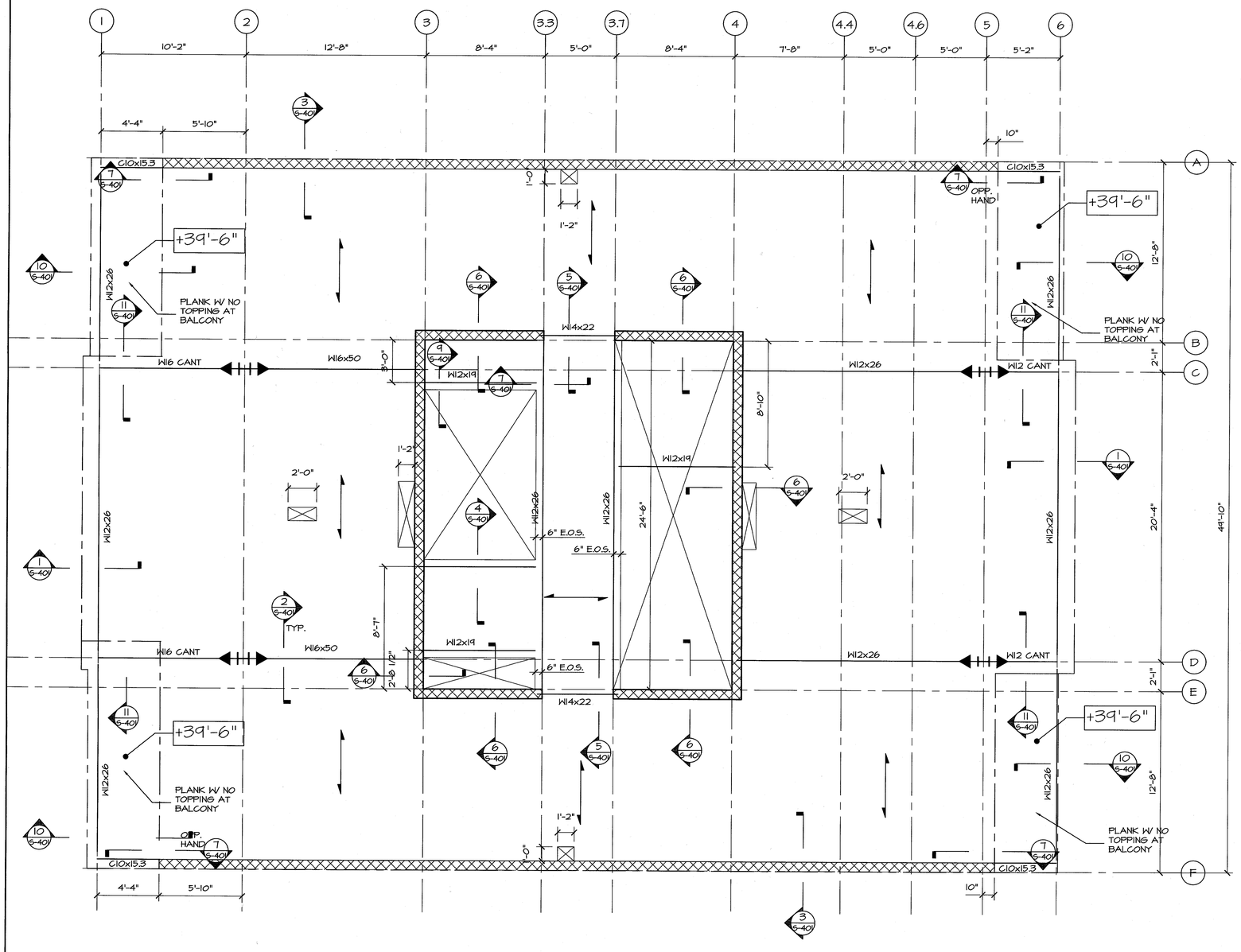
Drawing Name:
FOURTH FLOOR FRAMING PLAN

Drawing Number:
S-104

SHEET12of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW R. JARMEL
026677
STATE OF NEW YORK



FIFTH FLOOR FRAMING PLAN

SCALE 1/4" = 1'-0"

NOTES:

1. FLOOR CONSTRUCTION SHALL BE 6" HOLLOWCORE SLAB W/ 2" NORMAL WEIGHT CONCRETE TOPPING. CONCRETE TOPPING IS NONCOMPOSITE.
2. ←——→ INDICATES SPAN DIRECTION OF SLAB.
3. TOP OF CONCRETE IS AT +40'-0" UNLESS NOTED THUS [X'-X"] ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
4. TOP OF STEEL ELEVATION IS AT BOTTOM OF SLAB UNLESS NOTED THUS (+X'-X") ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
5. ▶—┤ INDICATES BEAM TO COLUMN AND BEAM TO BEAM MOMENT CONNECTION. SEE TYPICAL DETAILS FOR MORE INFORMATION.
6. SEE DRAWING S-200 FOR GENERAL NOTES AND TYPICAL DETAILS.
7. COORDINATE SIZE AND LOCATION OF ALL FLOOR PENETRATIONS AND SHAFTS WITH ARCHITECTURAL AND MEP DRAWINGS. SEE TYPICAL DETAILS FOR REQUIRED FRAMING AROUND OPENINGS.

FIFTH FLOOR LOAD SCHEDULE

DEAD LOAD:	
6" HOLLOWCORE SLAB W/2" TOPPING	74 PSF
CEILING	3 PSF
MEP	5 PSF
SPRINKLER/MISC	7 PSF
TOTAL DEAD LOAD	89 PSF
LIVE LOAD	40 PSF
TOTAL LOAD	129 PSF

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387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
SC	RAB

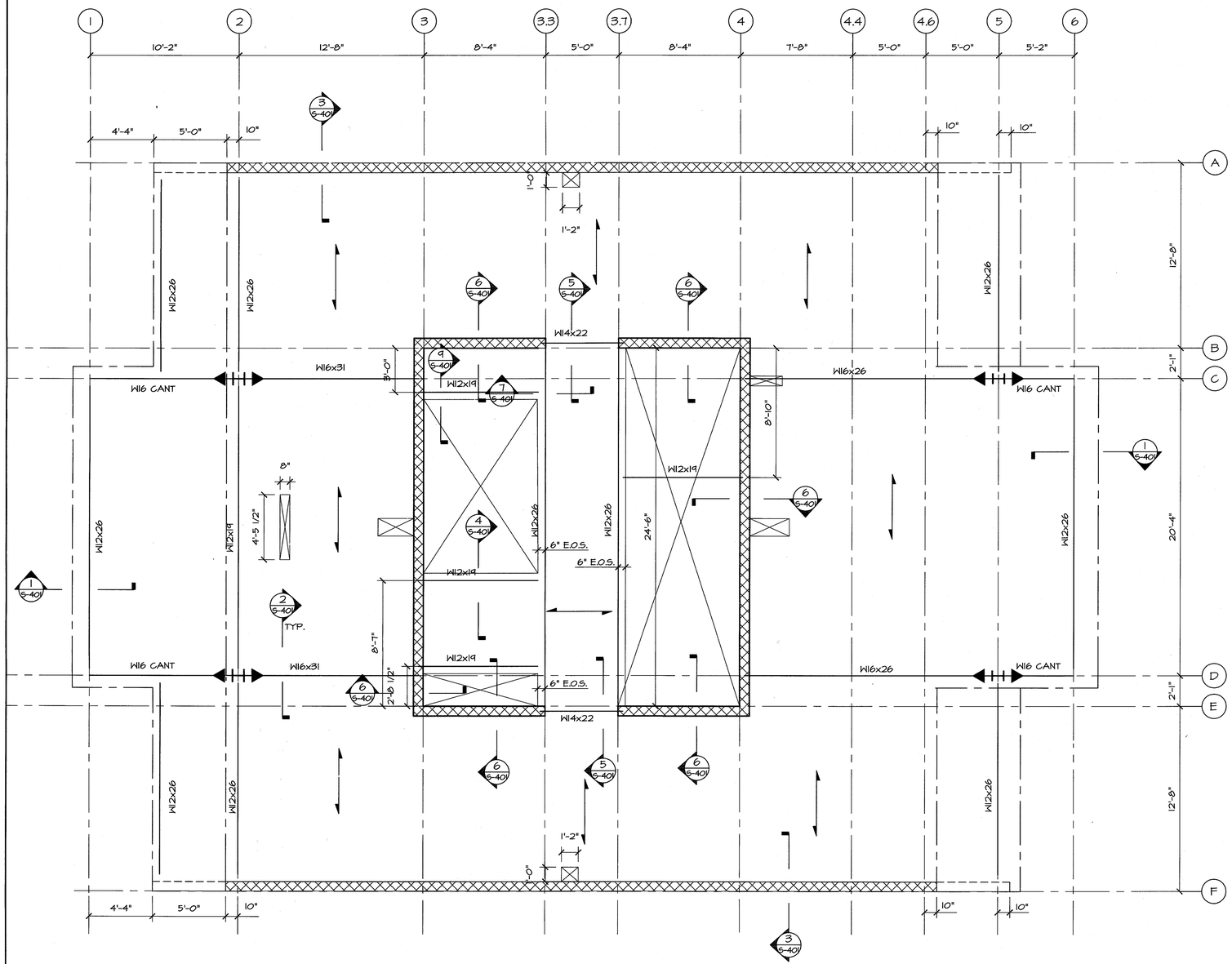
Drawing Name:
FIFTH FLOOR FRAMING PLAN

Drawing Number:
S-105

SHEET13of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
20487
STATE OF NEW YORK



SIXTH FLOOR FRAMING PLAN

SCALE 1/4" = 1'-0"

NOTES:

1. FLOOR CONSTRUCTION SHALL BE 6" HOLLOWCORE SLAB W/ 2" NORMAL WEIGHT CONCRETE TOPPING. CONCRETE TOPPING IS NONCOMPOSITE.
2. ⟷ INDICATES SPAN DIRECTION OF SLAB.
3. TOP OF CONCRETE IS AT +44'-6" UNLESS NOTED THUS [X'-X"] ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
4. TOP OF STEEL ELEVATION IS AT BOTTOM OF SLAB UNLESS NOTED THUS (+x'-x") ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
5. ⊢⟶⊣ INDICATES BEAM TO COLUMN AND BEAM TO BEAM MOMENT CONNECTION. SEE TYPICAL DETAILS FOR MORE INFORMATION.
6. SEE DRAWING S-200 FOR GENERAL NOTES AND TYPICAL DETAILS.
7. COORDINATE SIZE AND LOCATION OF ALL FLOOR PENETRATIONS AND SHAFTS WITH ARCHITECTURAL AND MEP DRAWINGS. SEE TYPICAL DETAILS FOR REQUIRED FRAMING AROUND OPENINGS.

SIXTH FLOOR LOAD SCHEDULE	
DEAD LOAD:	
6" HOLLOWCORE SLAB W/2" TOPPING	74 PSF
CEILING	3 PSF
MEP	5 PSF
SPRINKLER/MISC	7 PSF
TOTAL DEAD LOAD	84 PSF
LIVE LOAD	40 PSF
TOTAL LOAD	124 PSF

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10/03/2013

Project:

387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
SC	RAB

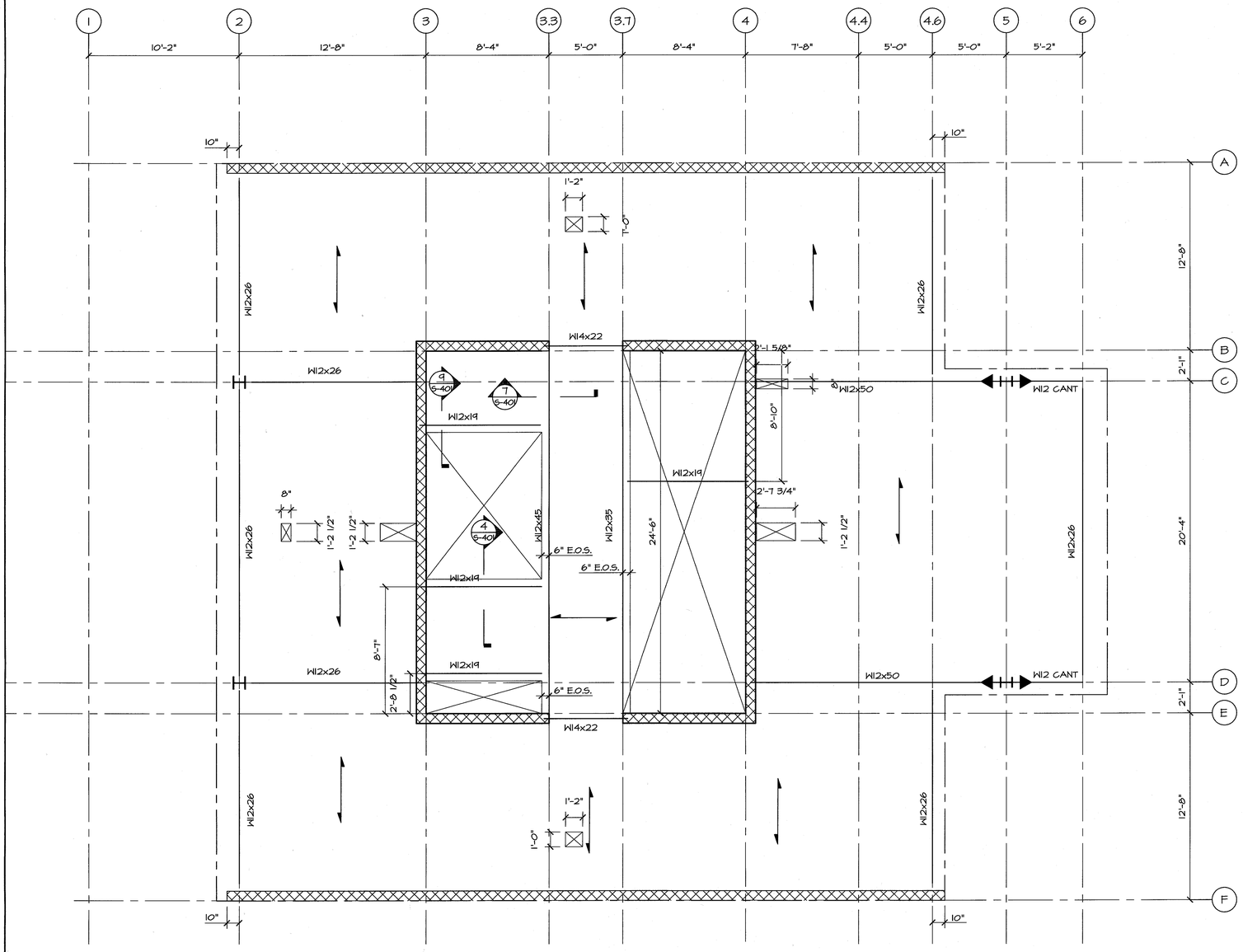
Drawing Name:
SIXTH FLOOR FRAMING PLAN

Drawing Number:
S-106

SHEET14of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
No. 24673
STATE OF NEW YORK



ROOF FRAMING PLAN

SCALE 1/4" = 1'-0"

NOTES:

1. FLOOR CONSTRUCTION SHALL BE 6" HOLLOWCORE SLAB W/ 2" NORMAL WEIGHT CONCRETE TOPPING. CONCRETE TOPPING IS NONCOMPOSITE.
2. ←——→ INDICATES SPAN DIRECTION OF SLAB.
3. TOP OF CONCRETE IS AT +59'-0" UNLESS NOTED THUS [X'-X"] ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
4. TOP OF STEEL ELEVATION IS AT BOTTOM OF SLAB UNLESS NOTED THUS (+x'-x") ON PLAN AND IS REFERENCED FROM THE BUILDING'S DATUM.
5. ▶—┼ INDICATES BEAM TO COLUMN AND BEAM TO BEAM MOMENT CONNECTION. SEE TYPICAL DETAILS FOR MORE INFORMATION.
6. SEE DRAWING S-200 FOR GENERAL NOTES AND TYPICAL DETAILS.
7. COORDINATE SIZE AND LOCATION OF ALL FLOOR PENETRATIONS AND SHAFTS WITH ARCHITECTURAL AND MEP DRAWINGS. SEE TYPICAL DETAILS FOR REQUIRED FRAMING AROUND OPENINGS.

ROOF LOAD SCHEDULE

ROOF DEAD LOAD:	
6" HOLLOWCORE W/2" TOPPING	74 PSF
STEEL/JOISTS	5 PSF
ROOFING/INSULATION	3 PSF
MEP	5 PSF
CEILING/MISC.	7 PSF
TOTAL DEAD LOAD	89 PSF
ROOF TOP ASSEMBLY LIVE LOAD:	100 PSF
DESIGN FLAT ROOF SNOW LOAD	30 PSF*

* GROUND SNOW LOAD TO BE ADJUSTED FOR DRIFT, SLIDING, UNBALANCED LOADING, ETC. PER CODE.

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DE LIC SS-00007256 — NC LIC 10120
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GA LIC RA011484 — NY LIC 024673
IA LIC 05377 — OH LIC A-99-12444
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VT LIC 88498 — MA LIC 50445

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NJ State Board of Architects Authorization No. 161
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10/03/2013

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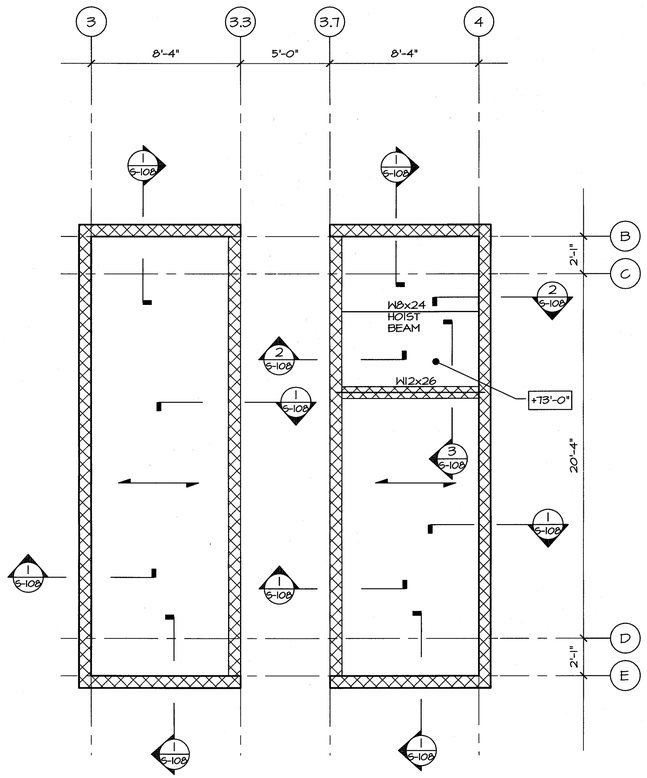
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number: CAPSTN-S-14-193
Scale: AS NOTED
Drawn By: SC
Approved By: RAB

Drawing Name:
ROOF FRAMING PLAN

Drawing Number:
S-107
SHEET15of 102
Initial Date:

REGISTERED ARCHITECT MATTHEW B. JARMEL 24673 STATE OF NEW YORK



HIGH ROOF FRAMING PLAN

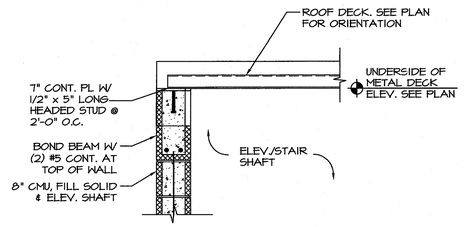
SCALE 1/4" = 1'-0"

NOTES:

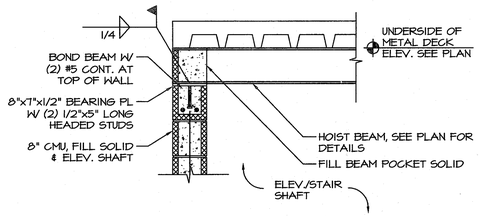
1. BULKHEADROOF CONSTRUCTION SHALL BE 3"-18 GA TYPE "N" DEEP RIB ROOF DECK.
2. BOTTOM OF METAL DECK ELEVATION IS +68'-0" UNLESS NOTED THUS (+X'-X") ON PLAN AND IS REFERENCED FROM THE BUILDING DATUM.
3. ——→ INDICATES SPAN DIRECTION OF SLAB.
4. SEE DRAWING S-200 FOR GENERAL NOTES AND TYPICAL DETAILS.
5. COORDINATE SIZE AND LOCATION OF ALL FLOOR PENETRATIONS AND SHAFTS WITH ARCHITECTURAL AND MEP DRAWINGS. SEE TYPICAL DETAILS FOR REQUIRED FRAMING AROUND OPENINGS.

ROOF LOAD SCHEDULE	
ROOF DEAD LOAD:	
3" ROOF DECK	4 PSF
STEEL/JOISTS	5 PSF
ROOFING/INSULATION	3 PSF
MEP	5 PSF
CEILING/MISC.	8 PSF
TOTAL DEAD LOAD	20 PSF
DESIGN FLAT ROOF SNOW LOAD	30 PSF*

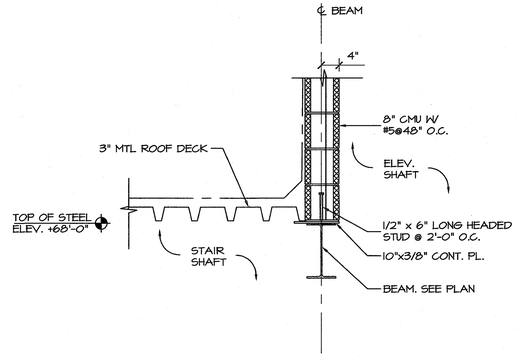
* GROUND SNOW LOAD TO BE ADJUSTED FOR DRIFT, SLIDING, UNBALANCED LOADING, ETC. PER CODE.



1 SECTION
SCALE : 3/4" = 1'-0"



2 SECTION
SCALE : 3/4" = 1'-0"



3 SECTION
SCALE : 3/4" = 1'-0"

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10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
SC	RAB

Drawing Name:
STAIR & ELEVATOR BULKHEAD FRAMING PLAN

Drawing Number:
S-108

SHEET16of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
STATE OF NEW YORK

GENERAL NOTES

1. ALL STRUCTURAL ITEMS FOR THIS PROJECT HAVE BEEN DESIGNED IN ACCORDANCE WITH APPROPRIATE PROVISIONS OF EACH OF THE FOLLOWING:

   A. BUILDING CODE: THE BUILDING CODE OF THE CITY OF NEW YORK, LATEST EDITION.
   B. STRUCTURAL STEEL: THE A.I.S.C. "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS ANSI/AISC 360-05."
   C. CONCRETE: A.C.I. "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE", ACI 318-08.
   D. MASONRY: A.C.I. "BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES," ACI 530-08.

2. THE STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE SPECIFICATIONS AND THE ARCHITECTURAL AND MECHANICAL DRAWINGS. IF THERE IS A DISCREPANCY BETWEEN DRAWINGS, IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE ARCHITECT AND/OR STRUCTURAL ENGINEER PRIOR TO PERFORMING WORK.
3. IN ANY CASE OF CONFLICT BETWEEN THE NOTES, DETAILS, AND SPECIFICATIONS, THE MOST RIGID REQUIREMENTS SHALL GOVERN.
4. DETAILS DESIGNATED AS "TYPICAL" APPLY TO ALL AREAS OF SIMILAR CONDITIONS UNLESS OTHERWISE NOTED.
5. MECHANICAL/PLUMBING/ELECTRICAL OPENINGS SHALL BE COORDINATED BY CONTRACTOR. FINAL SIZES AND LOCATIONS TO BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR APPROVAL.
6. CONTRACTOR IS RESPONSIBLE FOR AND SHALL VERIFY AND COORDINATE ALL DIMENSIONS, DETAILS, AND EXISTING CONDITIONS BEFORE PROCEEDING WITH WORK. ANY DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT AND/OR STRUCTURAL ENGINEER.
7. CONTRACTOR SHALL FULLY BRACE AND OTHERWISE PROTECT ALL WORK IN PROGRESS UNTIL THE STRUCTURE IS COMPLETED.
8. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR CONCRETE AND STRUCTURAL STEEL.
9. THE CONTRACTOR SHALL ENGAGE AN INDEPENDENT TESTING AND INSPECTION AGENCY ACCEPTABLE TO THE ARCHITECT AND/OR STRUCTURAL ENGINEER TO INSPECT THE FOLLOWING:

   A. SOIL
   B. STEEL - HIGH STRENGTH BOLTED CONNECTIONS AND WELDED CONNECTIONS IN THE SHOP AND FIELD
   C. CONCRETE - INSPECT REINFORCING PLACEMENT, INSPECT AND TEST CONCRETE QUALITY

   CONTRACTOR SHALL COORDINATE INSPECTIONS REQUIRED FOR THIS AGENCY.
10. ALL REQUESTS FOR SUBSTITUTIONS OF MATERIALS OR DETAILS SHOWN IN THE CONTRACT DOCUMENTS SHALL BE SUBMITTED FOR APPROVAL DURING THE BIDDING PERIOD. ONCE BIDS ARE ACCEPTED, PROPOSED SUBSTITUTIONS WILL BE CONSIDERED ONLY WHEN THEY ARE OFFICIALLY SUBMITTED WITH AN IDENTIFIED SAVINGS TO BE DEDUCTED FROM THE CONTRACT.

DESIGN LOADS

1. SEE PLANS FOR FLOOR AND ROOF DEAD AND LIVE LOADS
2. SNOW LOADS:

   GROUND SNOW LOAD, Pg = 30 PSF
   FLAT ROOF SNOW LOAD, Pf = 21 PSF *
   MINIMUM SNOW LOAD USED FOR DESIGN = 30 PSF
   SNOW EXPOSURE FACTOR, Ce = 1.0
   SNOW LOAD IMPORTANCE FACTOR, I = 1.0
   THERMAL FACTOR, Ct = 1.0

   * FLAT ROOF SNOW LOAD TO BE ADJUSTED PER CODE FOR DRIFT, SLIDING, UNBALANCED LOADING, ETC.

3. WIND LOADS:

   BASIC WIND SPEED, V = 98 MPH
   OCCUPANCY CATEGORY = II
   WIND IMPORTANCE FACTOR, I = 1.0
   WIND EXPOSURE = B
   INTERNAL PRESSURE COEFFICIENT GCpi = ±0.18
   COMPONENTS AND CLADDING PRESSURE:
   a = 5.0 FT
   ROOF:
   ZONE 1 P = +6.6 PSF, -20.5 PSF
   ZONE 2 P = +6.6 PSF, -24.0 PSF
   ZONE 3 P = +6.6 PSF, -24.0 PSF
   WALLS:
   FIELD P = +20.5 PSF, -22.3 PSF
   CORNERS P = +20.5 PSF, -27.5 PSF

4. SEISMIC LOADS:

   SEISMIC OCCUPANCY CATEGORY = II
   SEISMIC IMPORTANCE FACTOR, I = 1.0
   MAPPED SPECTRAL RESPONSE ACCELERATIONS:
   Ss = 0.281 g
   S1 = 0.073 g
   SITE CLASS = C
   SPECTRAL RESPONSE COEFFICIENTS:
   Sds = 0.295 g
   Sd1 = 0.117 g
   SEISMIC DESIGN CATEGORY = B
   BASIC SEISMIC-FORCE-RESISTING SYSTEM:
   ORDINARY REINFORCED MASONRY SHEAR WALLS
   DESIGN BASE SHEAR, V = 365 KIPS
   SEISMIC RESPONSE COEFFICIENT, Cs = 0.148
   RESPONSE MODIFICATION FACTOR, R = 2
   ANALYSIS PROCEDURE - EQUIVALENT LATERAL FORCE PROCEDURE

FOUNDATION CONSTRUCTION NOTES

1. FOUNDATIONS FOR THIS PROJECT CONSIST OF DRILLED STEEL MINI=PILES AND PILE CAPS. STEEL MINI-PILES HAVE BEEN DESIGNED AS 7 5/8" DIAMETER, GRADE 50 STEEL, WITH A NET VERTICAL CAPACITY OF 30 TONS AND AN ALLOWABLE LATERAL CAPACITY OF 1 TON, IN ACCORDANCE WITH "GEOTECHNICAL ENGINEERING INVESTIGATION AND FOUNDATION REPORT" PREPARED BY DEMERARA ENGINEERING LLC DATED DECEMBER 22, 2014. INSTALLATION OF THE PILES SHALL BE INSPECTED BY A GEOTECHINCAL ENGINEER LICENSED IN THE STATE OF NEW YORK.
2. STEEL MINI-PILE CAPACITIES ARE BASED ON A MINIMUM PILE DEPTH OF 25 FEET BELOW EXISTING GRADE WITH A SOIL/CONCRETE BOND LENGTH OF 20 FEET WITHIN THE C-2 SOIL STRATUM AS INDICATED IN THE FOUNDATION DESIGN REPORT. DEPTH TO C-2 SOIL STRATUM FOUND AT 50 FEET BELOW GRADE IN THE SINGLE BORING ADVANCED BELOW 35 FEET. ADDITIONAL BORINGS MAY BE DONE PRIOR TO CONSTRUCTION TO BETTER DEFINE THE STARTING POINT OF THE C-2 SOIL STRATUM AND DETERMINE THE EXACT LENGTH OF THE MINI-PILES.
3. DESIGN, FURNISH, AND PLACE ALL TEMPORARY OR PERMANENT SUPPORTS, WHETHER SHORING, SHEETING, OR BRACING, SO THAT NO HORIZONTAL MOVEMENT OR VERTICAL SETTLEMENT OCCURS TO EXISTING STRUCTURES, STREETS, OR UTILITIES ADJACENT TO PROJECT SITE.
4. CONTROL SURFACE AND SUBSURFACE WATER DURING CONSTRUCTION SO THAT FOUNDATION WORK WILL BE PERFORMED IN DRY CONDITIONS AND ON UNDISTURBED SOIL.
5. EXCAVATIONS FOR FOOTINGS SHALL BE FINISHED BY HAND.
6. FOUNDATION CONCRETE SHALL NOT BE PLACED IN WATER OR ON FROZEN GROUND.
7. ALL STRUCTURAL COMPACTED FILL SHALL CONSIST OF CLEAN, WELL-GRADED GRANULAR MATERIAL CONTAINING NO MORE THAN 12% NOR LESS THAN 5% BY WEIGHT OF MATERIAL PASSING THE #200 SIEVE. MATERIAL SHALL BE FREE FROM CLAY LUMPS, ORGANICS AND DELETERIOUS MATERIAL. EXISTING ON SITE FILL/EXCAVATED MATERIAL MAY BE USED FOR BACKFILLING PROVIDED IT IS INSPECTED BY THE SOILS ENGINEER AND MEETS THE CRITERIA ABOVE.

FOUNDATION CONSTRUCTION NOTES CONT'D

8. ALL STRUCTURAL COMPACTED FILL AND BACKFILL IN BUILDING AND WITHIN 5'-0" OF BUILDING SHALL BE PLACED IN 12" MAXIMUM LOOSE LIFTS AND COMPACTED WITH A HEAVY VIBRATORY COMPACTOR TO AT LEAST 95% OF THE MAXIMUM MODIFIED PROCTOR DENSITY AS PER ASTM D-1557-10 UNDER THE SUPERVISION OF A LICENSED SOILS ENGINEER.
9. ALL FILL AND BACKFILL SHALL BE PLACED ON VIRGIN SOIL THAT DOES NOT CONTAIN ANY ORGANIC MATERIAL. STRIP ALL TOP SOIL AS REQUIRED. PRIOR TO PLACING FILL OR BACKFILL, PROOF-COMPACT SUBGRADE WITH A HEAVY VIBRATORY COMPACTOR TO AT LEAST 95% OF THE MAXIMUM MODIFIED PROCTOR DENSITY AS PER ASTM D-1557-10 UNDER THE SUPERVISION OF A LICENSED SOILS ENGINEER.
10. FOUNDATION ELEMENTS SHALL BE CONSIDERED CENTERED UNDER COLUMN CENTERLINES UNLESS OTHERWISE NOTED.
11. NO FOOTINGS SHALL BE PLACED ABOVE I VERTICAL ON 2 HORIZONTAL SLOPE EXTENDED FROM THE CLOSEST EDGE OF ANY UNDISTURBED SOIL OR OTHER FOUNDATION STRUCTURE. BOTTOM OF EXTERIOR FOOTINGS SHALL NOT BE LESS THAN 3'-6" BELOW FINISHED GRADE.

CONCRETE CONSTRUCTION NOTES

1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE A.C.I. "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" (ACI 318).
2. CONCRETE DESIGN MIXES SHALL CONFORM WITH ASTM C94, AND HAVE PROPERTIES AS INDICATED BELOW:

   FOUNDATIONS, WALLS, AND PIERS: f'c=4,000 psi AT 28 DAYS MAX. W/C RATIO. 0.50 AIR CONTENT: 5% ± 1 1/2%

   SLABS: f'c=4,000 psi AT 28 DAYS MAX. W/C RATIO. 0.50 AIR CONTENT: 3% MAX.

3. SLUMP SHALL BE LIMITED TO 4 INCHES. FOR CONCRETE WITH HRWR (SUPER-P), SLUMP SHALL BE LIMITED TO 2-4 INCHES PRIOR TO ADDITION OF HRWR, AND A MAXIMUM OF 8 INCHES AFTER ADDITION OF HRWR.
4. ADMIXTURES USED IN CONCRETE SHALL BE AS ALLOWED BY THE SPECIFICATIONS AND ONLY WITH LABORATORY DESIGN MIX APPROVAL. ALL ADMIXTURES SHALL CONTAIN NO MORE CHLORIDE IONS THAN ARE PRESENT IN MUNICIPAL DRINKING WATER.
5. CONCRETE MATERIALS SHALL BE AS INDICATED BELOW:
   A. PORTLAND CEMENT: ASTM C150, TYPE I/II
   B. FLY ASH: ASTM C618 - 15% - 25% OF CEMENTITOUS MATERIAL
   C. NORMAL-WEIGHT AGGREGATES: ASTM C33, 3/4" MAXIMUM
   D. WATER: ASTM C94 AND POTABLE
6. ADMIXTURES SHALL BE AS INDICATED BELOW:
   E. AIR-ENTRAINING ADMIXTURE: ASTM C260
   F. WATER REDUCING ADMIXTURE: ASTM C494, TYPE A
   G. WATER REDUCING AND RETARDING ADMIXTURE: ASTM C494 TYPE D
   H. WATER-REDUCING, ACCELERATING ADMIXTURE: ASTM C494 TYPE E
   I. HIGH RANGE WATER REDUCING ADMIXTURE (SUPER-PLASTICIZER): ASTM C494, TYPE F
   J. HIGH RANGE WATER REDUCING AND RETARDING ADMIXTURE: ASTM C494 TYPE G
7. EPOXY JOINT FILLER SHALL BE A TWO-COMPONENT SEMI RIGID RESIN, 100% SOLIDS, AND HAVE A MINIMUM SHORE A HARDNESS OF 80 WHEN MEASURED IN ACCORDANCE WITH ASTM D 2240.
8. ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE, NEW BILLET STEEL, DEFORMED BARS, CONFORMING TO ASTM A-615, GRADE 60. ALL BARS SHALL BE SECURELY SUPPORTED AND WIRED IN PLACE PRIOR TO CONCRETE PLACEMENT.
9. ALL WELDED WIRE FABRIC (WWF) SHALL CONFORM TO ASTM A-185.
10. FIBER REINFORCING SHALL BE MONOFILAMENT POLYPROPYLENE FIBERS FOR SECONDARY REINFORCEMENT, ASTM C1116, TYPE III.
11. VAPOR RETARDER SHALL CONFORM TO ASTM E1745, CLASS C, WITH MINIMUM 10 MIL. THICKNESS.
12. REINFORCING STEEL SHOWN IN SECTIONS ARE SCHEMATIC INDICATIONS THAT REINFORCING EXISTS. SEE SECTION NOTES, SCHEDULES, PLAN NOTES, ETC. FOR ACTUAL REINFORCING REQUIRED.
13. UNLESS OTHERWISE NOTED, ALL BARS MARKED CONT. SHALL BE SPLICED AT ALL LAP POINTS AND CORNERS AND DEVELOPED AT NON-CONTINUOUS ENDS AS TYPICAL DETAILS. SPLICE CONTINUOUS TOP BARS AT CENTER BETWEEN SUPPORTS AND SPLICE CONTINUOUS BOTTOM BARS AT SUPPORTS. WELDED WIRE FABRIC SHALL BE LAPPED 12 INCHES OR TWO SPACINGS, WHICHEVER IS LONGER. SHEETS SHALL BE WIRED TOGETHER.
14. CONCRETE COVER FOR REINFORCING BARS SHALL BE AS SHOWN IN DETAILS.
15. AT OPENINGS IN CONCRETE WALLS, PROVIDE ADDED REINFORCEMENT IN ACCORDANCE WITH THE TYPICAL DETAILS UNLESS OTHERWISE NOTED.
16. REINFORCEMENT SHALL NOT BE WELDED OR HEATED IN ANY MANNER.
17. SLEEVES, MECHANICAL OPENINGS, CONDUITS, PIPES, RECESSES, DEPRESSIONS, CURBS, AND ALL EMBEDDED ITEMS SHALL BE PROVIDED FOR AS SHOWN ON THE ARCHITECTURAL AND MECHANICAL DRAWINGS AND AS REQUIRED BY EQUIPMENT MANUFACTURERS. MINIMUM CONCRETE BETWEEN SLEEVES SHALL BE 6". INSTALLATION OF THESE ITEMS SHALL BE COORDINATED WITH SHOP DRAWINGS OF TRADES REQUIRING THESE ITEMS.
18. SET FORMS TO FOLLOW SLOPES AND GRADES DEFINED ON PLAN, KEEPING MEMBER DEPTHS CONSTANT AS DETAILED OR SCHEDULED, UNLESS NOTED OTHERWISE. SLOPE UNIFORMLY BETWEEN ELEVATIONS GIVEN.
19. REINFORCING, INCLUDING WELDED WIRE FABRIC, FOR SLABS ON GRADE AND FOOTINGS SHALL BE SUPPORTED ON SOLID CONCRETE BLOCKS AT 5'-0" ON CENTER MAXIMUM EACH WAY. REINFORCING, INCLUDING WELDED WIRE FABRIC, FOR OTHER SLABS SHALL BE SUPPORTED ON CHAIRS AND BOLSTERS AT ALL SUPPORTS AND AT 5'-0" ON CENTER MAXIMUM BETWEEN SUPPORTS.
20. VERTICAL CONSTRUCTION JOINTS IN CONCRETE WALLS SHALL BE LOCATED AT MIDPOINT BETWEEN ANY SUPPORTING PIERS OR BUTTRESSES, AND AT LEAST 4'-0" FROM ANY WALL OPENING EXCEPT WHERE SPECIFICALLY SHOWN ON THE DRAWINGS. HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE PERMITTED, EXCEPT WHERE SHOWN ON DETAILS.
21. PROVIDE SHEAR KEY IN ALL CONSTRUCTION JOINTS IN WALLS.
22. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED AND TREATED WITH THE SPECIFIED BONDING COMPOUND JUST BEFORE PLACING NEW CONCRETE.
23. SEE ARCHITECTURAL DRAWINGS FOR DETAILS OF WEEPHOLES, FLASHING REGLETS, FASCIA DETAILS, ETC..
24. UNDER NO CIRCUMSTANCES SHALL CONCRETE BE PUMPED THROUGH ALUMINUM PIPES. CONCRETE SHALL NOT BE PLACED IN CONTACT WITH ALUMINUM, ALUMINUM MIXING DRUMS, TRUCK MIXERS, BUGGIES, CHUTES, CONVEYORS, TREMIE PIPES, AND OTHER EQUIPMENT MADE OF ALUMINUM SHALL NOT BE USED ON THIS PROJECT.
25. WHERE CONCRETE ABUTS MASONRY, PROVIDE VERTICAL METAL SLOTS TO RECEIVE GALVANIZED METAL DOVETAIL ANCHORS. SLOTS SHALL BE SPACED AT 24" ON CENTER.
26. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR FABRICATION, BENDING, AND PLACEMENT OF CONCRETE REINFORCEMENT. SHOP DRAWINGS SHALL COMPLY WITH ACI 315 "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES".
27. ALL CONCRETE REINFORCING IS SUBJECT TO INSPECTION BY THE DESIGN ENGINEER PRIOR TO CONCRETE PLACEMENT. CONTRACTOR SHALL NOTIFY ENGINEER OF ANY DISCREPANCY FROM ACI 315 "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES".
28. COLD OR HOT WEATHER CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THE APPLICABLE CODE REQUIREMENTS.
29. INSTALLATION OF POST-INSTALLED ADHESIVE ANCHORS MUST BE INTO CONCRETE THAT HAS A MINIMUM AGE OF 21 DAYS AT THE TIME OF INSTALLATION.

MASONRY CONSTRUCTION NOTES

1. ALL CONCRETE MASONRY CONSTRUCTION SHALL CONFORM TO THE INTERNATIONAL BUILDING CODE, IBC 2009, NEW JERSEY EDITION AND AMERICAN CONCRETE INSTITUTE, ACI 530.1-08, SPECIFICATION FOR MASONRY STRUCTURES.
2. ALL CONCRETE MASONRY UNITS SHALL BE HOLLOW LOAD BEARING UNITS CONFORMING TO ASTM C90, WITH COMPRESSIVE STRENGTH (f'm) OF 1500 PSI.
3. ALL INDIVIDUAL CONCRETE MASONRY UNITS SHALL HAVE A MINIMUM NET AREA COMPRESSIVE STRENGTH OF 1900 PSI.
4. CONCRETE MASONRY UNITS SHALL BE IN RUNNING BOND PATTERN.
5. MORTAR SHALL CONFORM TO ASTM C270, TYPE "M" OR "S".
6. ALL CONCRETE MASONRY WALL SHALL HAVE FULL BED MORTAR.
7. ALL CONCRETE MASONRY WALLS SHALL HAVE LADDER TYPE HORIZONTAL JOINT REINFORCEMENT WITH 3/16" SIDE RODS, SPACED AT 8 INCHES ON CENTER BELOW GRADE AND SPACED 16 INCHES ON CENTER ABOVE GRADE, UNLESS OTHERWISE NOTED ON DRAWINGS. PROVIDE PREFABRICATED CORNER AND TEE SECTIONS AT ALL WALL INTERSECTIONS.
8. GROUT FOR CORES, BOND BEAMS, AND WITHIN CONCRETE MASONRY UNITS AS INDICATED ON DRAWINGS, SHALL CONFORM TO ASTM C476 AND DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI. ALL CONCRETE MASONRY CORES CONTAINING REINFORCING SHALL BE FILLED SOLID.
11. GROUT SHALL NOT BE POURED IN LIFTS GREATER THAN 5 FEET AT A TIME.
12. PROVIDE VERTICAL CONTROL JOINTS AT A MAXIMUM OF 30 FT ON CENTER. TERMINATE HORIZONTAL JOINT REINFORCING AT EITHER SIDE OF CONTROL JOINT. BOND BEAM REINFORCING SHALL BE CONTINUOUS THROUGH CONTROL JOINT.
13. ALL REINFORCING WITHIN CONCRETE MASONRY WALLS SHALL CONFORM TO ASTM A615, GRADE 60.
14. UNLESS OTHERWISE NOTED ON DRAWINGS, PROVIDE ADDITIONAL #5 MINIMUM VERTICAL AT ALL OPENINGS, CORNERS, AND WALL INTERSECTIONS. PROVIDE ADDITIONAL #5 MINIMUM HORIZONTAL ABOVE AND BELOW OPENINGS. EXTEND HORIZONTAL BARS 2'-0" MINIMUM BEYOND EACH SIDE OF OPENING.

STEEL CONSTRUCTION NOTES

1. ALL STRUCTURAL STEEL WORK SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST AISC CODE OF STANDARD PRACTICE. STRUCTURAL STEEL SHALL BE NEW, CLEAN, AND STRAIGHT, AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:
   A. WIDE FLANGE ROLLED SHAPES: ASTM A992, GRADE 50 (Fy = 50 KSI).
   B. PLATES, ANGLES, BARS, CHANNELS, AND S SHAPES: ASTM A36 (Fy = 36 KSI).
   C. RECTANGULAR HSS: ASTM A500, GRADE B (Fy = 46 KSI).
   D. ROUND HSS: ASTM A500, GRADE B (Fy = 42 KSI).
   E. PIPE: ASTM A53, TYPE E OF S, GRADE B (Fy = 35 KSI).
2. ALL ANCHOR RODS, UNLESS OTHERWISE NOTED, SHALL BE ASTM F1554, GRADE 36.
3. ALL BOLTED CONNECTIONS, UNLESS OTHERWISE NOTED, SHALL BE 3/4"Φ A325 HIGH STRENGTH BOLTS, IN BEARING TYPE CONNECTIONS AND SHALL BE PROVIDED WITH HARDENED WASHERS UNDER THE TURNED ELEMENT (NUT OR BOLT THREAD).
4. ALL STRUCTURAL STEEL SHALL BE PAINTED WITH ONE COAT OF SHOP PRIMER, EXCEPT WHERE FIELD WELDING OR SLIP CRITICAL BOLTING IS TO BE DONE, STEEL TO RECEIVE SPRAY-ON FIREPROOFING, STEEL TO BE EMBEDDED IN CONCRETE, AND STEEL TO BE HOT-DIPPED GALVANIZED.
5. STRUCTURAL STEEL EXPOSED TO WEATHER, EXCESSIVE MOISTURE, OR CORROSIVE ENVIRONMENT AND AS INDICATED ON CONSTRUCTION DOCUMENTS, SHALL BE HOT-DIPPED GALVANIZED, MEETING REQUIREMENTS OF ASTM A123 AND A153 AS APPLICABLE.
6. INSTALLATION AND TIGHTENING OF ALL HIGH STRENGTH BOLTS SHALL CONFORM TO THE AISC "SPECIFICATION FOR THE STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS."
7. CONNECTIONS MAY BE WELDED OR HIGH STRENGTH BOLTED. ALL CONNECTIONS SHALL CONFORM TO THE TYPICAL CONNECTION DETAILS SHOWN ON THE DRAWINGS.
8. ALL WELDING SHALL CONFORM TO THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE - STEEL (AWS D1.1) AND SHALL BE DONE BY A.W.S. QUALIFIED WELDERS USING E70XX ELECTRODES.
9. ALL CONTACT SURFACES WITHIN HIGH STRENGTH BOLTED CONNECTIONS AND WELDING AREAS SHALL BE FREE OF OIL, PAINT, AND LACQUER.
10. THE CONTRACTOR SHALL COORDINATE THE SIZE AND LOCATION OF ALL ROOF OPENINGS SHOWN ON THE STRUCTURAL, ARCHITECTURAL AND/OR MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS. ANY STEEL WHICH IS NOT SHOWN ON THE CONTRACT DRAWINGS AS FURNISHED BY THE STRUCTURAL STEEL CONTRACTOR AND WHICH IS REQUIRED BY THE MECHANICAL, PLUMBING, AND ELECTRICAL TRADES FOR OPENINGS AND/OR TO SUPPORT THEIR WORK SHALL BE SUPPLIED AND INSTALLED BY THE CONTRACTOR REQUIRING SUCH STEEL, UNLESS OTHERWISE NOTED.
11. CUTS, HOLES, COPING, ETC. REQUIRED IN STRUCTURAL STEEL MEMBERS FOR THE WORK OF OTHER TRADES SHALL BE SHOWN ON THE STRUCTURAL STEEL SHOP DRAWINGS AND BE MADE IN THE SHOP. HOLES SHALL BE REINFORCED AND APPROVED BY THE STRUCTURAL ENGINEER.
12. BURNING OF HOLES, CUTS, ETC. IN STRUCTURAL STEEL MEMBERS IN THE FIELD WILL NOT BE PERMITTED, EXCEPT WITH THE SPECIFIC WRITTEN PERMISSION OF THE ENGINEER.
13. FOR MISCELLANEOUS STEEL, SEE ARCHITECTURAL DRAWINGS.
14. SUBMIT ALL STRUCTURAL STEEL SHOP DRAWINGS FOR REVIEW PRIOR TO ANY FABRICATION.

COLD-FORMED METAL FRAMING CONSTRUCTION NOTES

1. COLD-FORMED METAL FRAMING USED IN THE EXTERIOR WALLS ARE CONSIDERED STRUCTURAL FRAMING. PROVIDE ENGINEERING DESIGN BY AN ENGINEERED LICENSED IN THE STATE OF NEW YORK FOR ALL STRUCTURAL FRAMING. ENGINEERING DESIGN SHALL INCLUDE ALL GRAVITY AND LATERAL LOADS.
2. COLD-FORMED METAL FRAMING SHALL BE DESIGNED IN ACCORDANCE WITH THE AMERICAN IRON AND STEEL INSTITUTE'S (AISI) "NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS", LATEST EDITION.
3. SHOP DRAWINGS AND SIGNED AND SEALED CALCULATIONS SHALL BE SUBMITTED FOR REVIEW FOR ALL STRUCTURAL ELEMENTS AS INDICATED IN NOTE #1 ABOVE. SHOP DRAWINGS SHALL SPECIFY MATERIAL, SHOP COATINGS, STEEL SIZE AND THICKNESS, CONNECTION DETAILS, AND OTHER INFORMATION AS REQUIRED FOR INSTALLATION.
4. DEFLECTION OF STEEL STUDS IN EXTERIOR WALLS SHALL BE LIMITED TO A MAXIMUM OF [L/240 FOR EIFS OR METAL PANELS, L/360 FOR STUCCO, L/600 TO L/720 FOR BRICK/STONE/MASONRY].
5. ALL EXTERIOR STEEL STUDS SHALL BE A MINIMUM 6" DEPTH, 1 5/8" WIDE, 18 GAGE MINIMUM AT 16" O.C. MAXIMUM. STEEL TRACK SHALL MATCH STUD DEPTH AND GAGE, WITH MANUFACTURES STANDARD FLANGE WIDTH.
6. ALL STUDS, TRACKS AND ACCESSORIES SHALL BE GALVANIZED TO HAVE A MINIMUM G-60 COATING AND CONFORM TO THE REQUIREMENTS OF ASTM A653. 18 GAGE OR LIGHTER MATERIAL SHALL HAVE A MINIMUM YIELD OF 33 KSI. 16 GAGE OR HEAVIER MATERIAL SHALL HAVE A YIELD OF EITHER 50 KSI OR 33 KSI.
7. CONNECTIONS BETWEEN COLD-FORMED METAL FRAMING MEMBERS SHALL BE BY WELDING OR SCREW FASTENING. SCREWS SHALL PENETRATE JOINED MEMBERS BY NOT LESS THAN 3 EXPOSED SCREW THREADS.
8. SECURE TRACKS TO STEEL WITH #10 SCREW SPACED AT 24" O.C., MINIMUM.
9. SECURE TRACKS TO CONCRETE WITH POWDER ACTUATED FASTENER WITH A SHANK DIAMETER OF 0.177" AND MINIMUM EMBEDMENT OF 1 1/2", SPACED AT 24" O.C., MINIMUM.
10. ALL WELDING SHALL CONFORM WITH AMERICAN WELDING SOCIETY (AWS) D1.3: STRUCTURAL WELDING CODE - SHEET STEEL. THE MINIMUM GAGE OF FIELD-WELDED COLD-FORMED STEEL SHALL BE 16 GAGE.
11. ALL CUTTING OF FRAMING MEMBERS SHALL BE SAWED OR SHEARED. DO NOT TORCH CUT.
12. NON-LOAD BEARING STUD WALLS SHALL BE BRACED AT THE TOP WITH A VERTICAL SLIP CONNECTION TO ALLOW FOR ROOF AND FLOOR DEFLECTIONS OF L/360.

PRECAST CONCRETE NOTES

1. PRECAST PRESTRESSED CONCRETE HOLLOW CORE SLAB UNITS (f'c=5000 PSI) SHALL BE 4 OR 8 FOOT WIDTHS AND SHALL MEET PCI STANDARDS AND TOLERANCES, 2" MINIMUM BEARING, UNLESS OTHERWISE SPECIFIED. OPEN TOP OF EACH SLAB CORE FOR PROPER GROUT PLACEMENT AND INSPECTION.
2. DESIGN OF PLANKS SHALL BE PERFORMED BY AN ENGINEER LICENSED IN THE STATE OF NEW YORK AND SHALL BE SUBMITTED FOR REVIEW WITH HOLLOW CORE SLAB SHOP DRAWINGS.
3. DESIGN SHALL BE IN ACCORDANCE WITH ACI 318 AND APPLICABLE BUILDING CODES.
4. LOADINGS FOR DESIGN SHALL INCLUDE ALL DEAD AND LIVE LOADS INDICATED ON PLAN AND ANY INITIAL HANDLING AND ERECTION STRESSES.
5. CEMENTITIOUS GROUT SHALL ACHIEVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI. GROUT SHALL COMPLETELY FILL CORES SOLID FOR A MINIMUM OF 8" OR AS OTHERWISE REQUIRED BY DESIGN.
6. PRESTRESSING STRANDS SHALL BE ASTM A416 GRADE 250 OR GRADE 270, SEVEN-WIRE LOW RELAXATION STRAND.

SHOP DRAWING SUBMITTALS

1. GENERAL CONTRACTOR SHALL SHOP DRAWINGS TO THE ENGINEER FOR REVIEW ALL REQUIRED INFORMATION AS INDICATED IN THE DRAWINGS AND SPECIFICATIONS, PRIOR TO ANY FABRICATION.
2. NO PORTION OF THE STRUCTURAL DRAWINGS SHALL BE REPRODUCED FOR USE AS SHOP DRAWINGS.
3. ALL DIMENSIONS SHALL BE COORDINATED BY THE CONTRACTOR AND/OR THE DETAILER.
4. DETAILER SHALL USE THE SAME GRID IDENTIFICATIONS AS THOSE SHOWN ON THE CONTRACT DRAWINGS.
5. ALL SHOP DRAWINGS SHALL BE SUBMITTED PRIOR TO PROCEEDING WITH ANY ASSOCIATED WORK AND SHALL ALLOW FOR SUFFICIENT REVIEW TIME.
6. SHOP DRAWINGS SHALL BE SUBMITTED WITH CONTRACTOR'S STAMP OF APPROVAL, CERTIFYING THE CONTRACTOR HAS COORDINATED AND VERIFIED ALL DIMENSIONS, MATERIALS, AND ANY ADDITIONAL INFORMATION AFFECTING STRUCTURAL WORK. THE CONTRACTOR'S REVIEW INCLUDES BUT IS NOT LIMITED TO COORDINATION AND VERIFICATION OF ACTUAL FIELD CONDITIONS, DIMENSIONS, ELEVATIONS, AND SUPPORTS AND OPENINGS FOR ACTUAL EQUIPMENT PURCHASED.
7. SHOP DRAWINGS NO COMPLYING WITH THE ABOVE SHALL BE RETURNED FOR CORRECTION WITHOUT REVIEWING.
8. RESUBMITTED SHOP DRAWINGS SHALL INCLUDE ALL CHANGES ON THE DRAWINGS CLOUDED AND MARKED WITH REVISION TAG NUMBER.
9. CONTRACTOR SHALL NOT PROCEED WITH ANY WORK UNTIL THE SHOP DRAWINGS HAVE BEEN REVIEWED AND APPROVED BY THE ENGINEER.

METAL DECK CONSTRUCTION NOTES

1. ALL STEEL DECK SHALL CONFORM TO THE LATEST EDITION OF THE FOLLOWING CODES AND SPECIFICATIONS:
   A. AMERICAN IRON AND STEEL INSTITUTE (AISI) SPECIFICATION FOR DESIGN OF COLD FORMED STEEL STRUCTURAL MEMBERS, LATEST EDITION.
   B. AMERICAN WELDING SOCIETY (AWS) D1.3 STRUCTURAL WELDING CODE/SHEET STEEL.
   C. STEEL DECK INSTITUTE (S.D.I.) DESIGN MANUAL, LATEST EDITION.
   D. AMERICAN INSTITUTE OF STEEL CONSTRUCTION - SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS (ANSI/AISC 360-05).
2. STEEL ROOF SHALL BE AS INDICATED ON PLANS. MATERIAL SHALL CONFORM TO ASTM A653, GRADE 33, WITH MINIMUM YIELD STRENGTH OF 33,000 PSI.
3. ALL STEEL ROOF DECK SHALL BE GALVANIZED AND CONFORM TO ASTM A924 WITH A MINIMUM COATING OF G60 AS DEFINED IN ASTM A653.
4. CONSTRUCTION LOADS SHALL BE PLACED SUCH THAT THEY DO NOT EXCEED DESIGN LIVE LOADS. ALL STEEL ROOF DECK AND STEEL FLOOR DECK SHALL BE FULLY INSTALLED AND CAPABLE OF SUPPORTING LOADS SHOWN ON PLAN AND FOR THE INDICATED SPANS AND ALL CONSTRUCTION LOADS PRIOR TO LOADING.
5. ANCHOR STEEL ROOF DECK AT ENDS AND AT ALL INTERMEDIATE SUPPORTING MEMBERS WITH 5/8" DIAMETER PUDDLE WELDS AT 8" O.C. AT THE BOTTOM OF THE RIB ACROSS THE WIDTH OF THE DECK UNIT UNLESS NOTED OTHERWISE.
6. SIDE LAPS OF STEEL ROOF DECK SHALL BE FASTENED AT 18" O.C. MAXIMUM WITH #10 SELF-DRILLING SCREWS, 5/8" DIAMETER PUDDLE WELDS, OR 1 INCH LONG FILLET WELD.
7. ALL ELECTRICAL, MECHANICAL AND PIPING EQUIPMENT, PIPING, DUCTWORK, ETC. SHALL BE HUNG FROM STEEL BEAMS ONLY. WORK SHALL NOT BE HUNG FROM METAL DECK.
8. CUT OUT METAL DECK WHERE BOLT OR PLATE PROJECTIONS INTERFERE WITH METAL DECK BEARING.

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SPECIAL INSPECTIONS STEEL CONSTRUCTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD	IBC REFERENCE
1. MATERIAL VERIFICATION OF HIGH STRENGTH BOLTS, NUTS, AND WASHERS:				
A. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	-	X	APPLICABLE ASTM MATERIAL SPECS. AISC 335, SECTION A3.4; AISC LRFD, SECTION A3.3	-
B. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED	-	X	-	-
2. INSPECTION OF HIGH-STRENGTH BOLTING:				
A. BEARING TYPE CONNECTIONS.	-	X NOTE A	AISC LRFD SECTION M2.5	1704.3.3
B. SLIP-CRITICAL CONNECTIONS	-	X		
3. MATERIAL VERIFICATION OF STRUCTURAL STEEL:				
A. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS	-	-	ASTM A6 OR ASTM A568	1708.4
B. MANUFACTURER'S CERTIFIED MILL TEST REPORTS	-	-	ASTM A6 OR ASTM A568	
4. MATERIAL VERIFICATION OF WELD FILLER MATERIALS:				
A. IDENTIFICATION MARKINGS TO CONFORM TO AWS SPECIFICATION IN THE APPROVED CONSTRUCTION DOCUMENTS	-	-	AISC, ASD, SECTION A3.6; AISC LRFD, SECTION A3.5	-
B. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	-	-	-	-
5. INSPECTION OF WELDING: a. STRUCTURAL STEEL:	-	-		
1) COMPLETE AND PARTIAL PENETRATION GROOVE WELDS.	X	-	AWS D1.1	1704.3.1
2) MULTIPASS FILLET WELDS.	X	-		
3) SINGLE-PASS FILLET WELDS > 5/16"	X	-		
4) SINGLE-PASS FILLET WELDS ≤5/16"	-	X		
5) FLOOR AND ROOF DECK WELDS	-	X	AWS D1.3	-
6. INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS: A. DETAILS SUCH AS BRACING AND STIFFENING. B. MEMBER LOCATIONS. C. APPLICATION OF JOINT DETAILS AT EACH CONNECTION	- - -	X - -	-	1704.3.2

NOTE A: TURN OF THE NUT BOLTING SHALL BE CONTINUOUSLY INSPECTED. EXCEPTION: PERIODIC INSPECTION SHALL BE ACCEPTABLE WHEN THE CONTRACTOR'S PROCEDURES HAVE BEEN ESTABLISHED AND VERIFIED FOR COMPLIANCE BY THE SPECIAL INSPECTOR.

SPECIAL INSPECTIONS CONCRETE CONSTRUCTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD	IBC REFERENCE
1. INSPECTION OF REINFORCING STEEL.	-	X	ACI 318:3.5, 7.1-7.7	1903.5, 1907.1, 1907.7, 1914.4
2. VERIFYING USE OF REQUIRED DESIGN MIX.	-	X	ACI 318: CH4, 5.2-5.4	1904, 1905.5-1905.4, 1914.2, 1914.3
3. AT THE TIME FRESH CONCRETE IS SAMPLED TO FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X	-	ASTM C172, ASTM C31 ACI 318: 5.6, 5.8 (NOTE A, B)	1905.6, 1914.10
4. INSPECTION OF CONCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	X	-	ACI 318: 5.9, 5.10	1905.9, 1905.10, 1914.6, 1914.7, 1914.8
5. INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	-	X	ACI 318: 5.11-5.13	1905.11, 1905.13, 1914.9
6. ERECTION OF PRECAST CONCRETE MEMBERS.	-	X	ACI 318: CH. 16	-

SPECIAL INSPECTIONS REQUIRED VERIFICATION AND INSPECTION OF SOILS	CONTINUOUS	PERIODIC
1. VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE DESIGN BEARING CAPACITY.	-	X
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	-	X
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.	-	X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL	X	-
5. PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.	-	X

SPECIAL INSPECTIONS LEVEL 2 MASONRY CONSTRUCTION	CONTINUOUS	PERIODIC	REFERENCE FOR CRITERIA		
			IBC SECTION	ACI 530/ASCE 5/ TMS 402	ACI 530.1/ASCE 6/ TMS 602
1. FROM THE BEGINNING OF MASONRY CONSTRUCTION, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE:					
A. PROPORTIONS OF SITE-PREPARED MORTAR AND GROUT.	-	X	-	-	ART. 2.6A
B. PLACEMENT OF MASONRY UNITS AND CONSTRUCTION OF MORTAR JOINTS.	-	X	-	-	ART. 3.3B
C. PLACEMENT OF REINFORCEMENT, CONNECTORS AND ANCHORAGES.	-	X	-	SEC 1.12	ART. 3.4, 3.6A
D. GROUT SPACING PRIOR TO GROUTING.	X	-	-	-	ART. 3.2D
E. PLACEMENT OF GROUT	X	-	-	-	ART. 3.5
2. THE INSPECTION PROGRAM SHALL VERIFY:					
A. SIZE AND LOCATION OF STRUCTURAL ELEMENTS.	-	X	-	-	ART. 3.3G
B. TYPE, SIZE, AND LOCATION OF ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTRUCTION.	X	-	-	SEC. 1.2.2(6), 2.1.4, 3.1.6	-
C. SPECIFIED SIZE, GRADE, AND TYPE OF REINFORCEMENT	-	X	-	SEC. 1.12	ART. 2.4, 3.4
D. WELDING REINFORCEMENT	X	-	-	SEC. 2.1.10.6.2, 3.2.3.4(b)	-
E. PROTECTION OF MASONRY DURING COLD WEATHER (TEMPERATURE BELOW 40°F) OR HOT WEATHER (TEMPERATURE ABOVE 90°F)	-	X	SEC. 2104.3, 2104.4	-	ART. 1.8C, 1.8D
3. PREPARATION OF ANY REQUIRED GROUT SPECIMENS, MORTAR SPECIMENS, AND/OR PRISMS SHALL BE OBSERVED.	X	-	SEC. 2105.2.2, 2105.3	-	ART. 1.4
4. COMPLIANCE WITH REQUIRED INSPECTION PROVISIONS OF THE CONSTRUCTION DOCUMENTS AND THE APPROVED SUBMITTALS SHALL BE VERIFIED.	-	X	-	-	ART. 1.5

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NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA-278177

11/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number: CAPSTN-S-14-193
Scale: AS NOTED
Drawn By: SC
Approved By: RAB

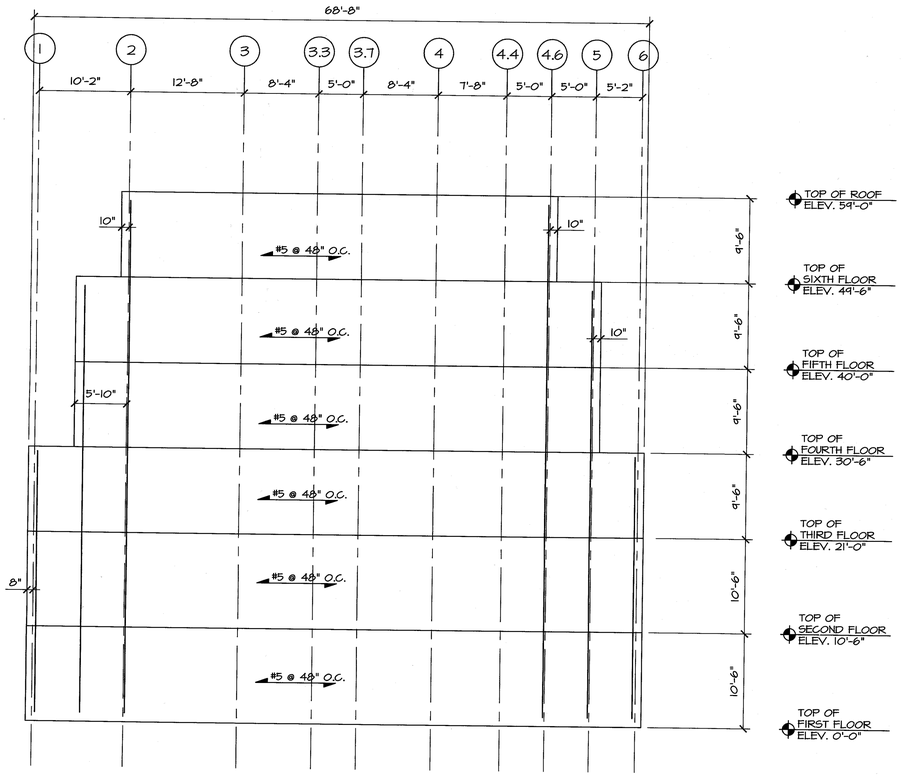
Drawing Name:
SPECIAL INSPECTIONS

Drawing Number:
S-201

SHEET18of 102

Initial Date:

REGISTERED ARCHITECT
MATTHEW B. JARMEL
No. 24813
STATE OF NEW YORK



1 ELEVATION
SCALE : 1/8" = 1'-0"

NOTES:
1. AT END OF EACH WALL, ADD AN ADDITIONAL 2-#5 AS SHOWN IN THE ELEVATION.

COLUMN SCHEDULE

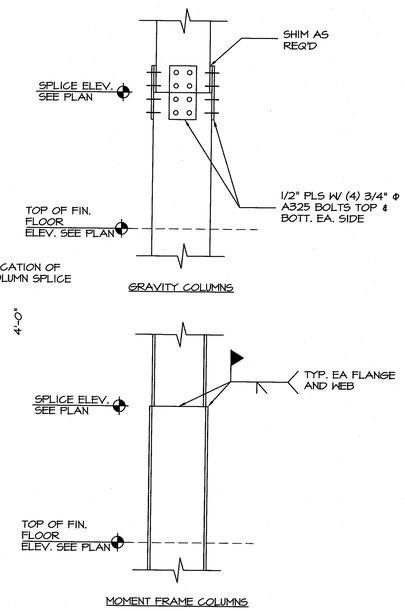
COLUMN LOCATION / LEVEL	2 C	2 D	5 C	5 D
TOP OF ROOF ELEV. 59'-0"				
TOP OF SIXTH FLOOR ELEV. 49'-6"	W10 x 54	W10 x 54	W10 x 54	W10 x 54
TOP OF FIFTH FLOOR ELEV. 40'-0"				
TOP OF FOURTH FLOOR ELEV. 30'-6"				
TOP OF THIRD FLOOR ELEV. 21'-0"	W10 x 54	W10 x 54	W10 x 54	W10 x 54
TOP OF SECOND FLOOR ELEV. 10'-6"				
TOP OF FIRST FLOOR ELEV. 0'-0"				
BASE PLATE SIZE	24x24x1 1/8	24x24x1 1/8	24x24x1 1/8	24x24x1 1/8
BASE PLATE TYPE	BPI	BPI	BPI	BPI

LOCATION OF COLUMN SPLICE

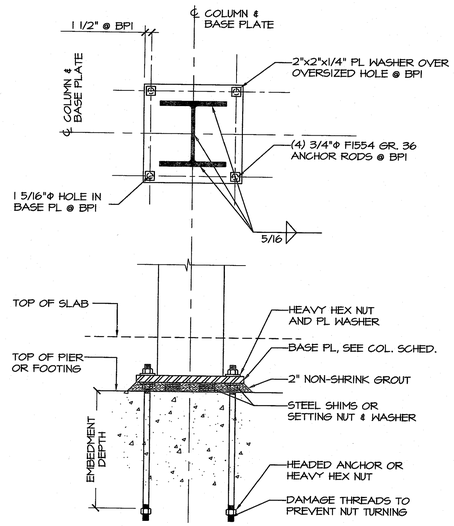
4'-0"

COLUMN SCHEDULE NOTES:

1. TOP HEAVY LINE IN COLUMN SCHEDULE INDICATES REFERENCE TOP OF COLUMN. SEE PLANS AND SECTIONS FOR ACTUAL ELEVATIONS.
2. BOTTOM HEAVY LINE IN COLUMN SCHEDULE INDICATES BOTTOM OF COLUMN BASE PLATE.
3. ALL WF COLUMNS SHALL BE ASTM A992 GRADE 50 KSI STEEL.
4. ALL PLATES SHALL BE ASTM A36 STEEL UNLESS NOTED OTHERWISE.
5. FIRST DIMENSION OF BASE PLATE IS IN THE DIRECTION OF THE COLUMNS STRONG AXIS, UNLESS NOTED OTHERWISE.
6. FOR DETAIL OF BEAM TO COLUMN CONNECTIONS, SEE STANDARD BEAM CONNECTION DETAIL.
7. — — — INDICATES LOCATION OF COLUMN SPLICE. SEE TYPICAL COLUMN SPLICE DETAIL.

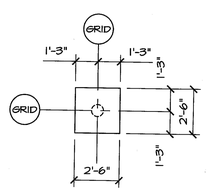


- TYPICAL COLUMN SPLICE DETAILS
SCALE : 3/4" = 1'-0"

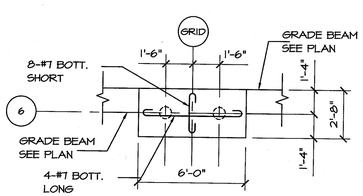


- TYPICAL BASE PLATE DETAIL
SCALE : 3/4" = 1'-0"

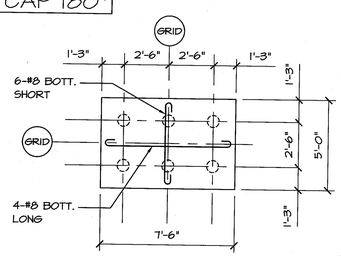
HOOK BOTH ENDS OF ALL BARS IN PILE CAP 180°



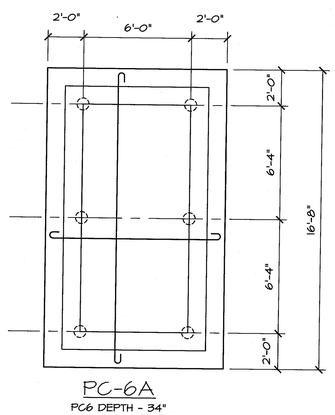
PC-1
DEPTH - 34"
NO REINFORCING



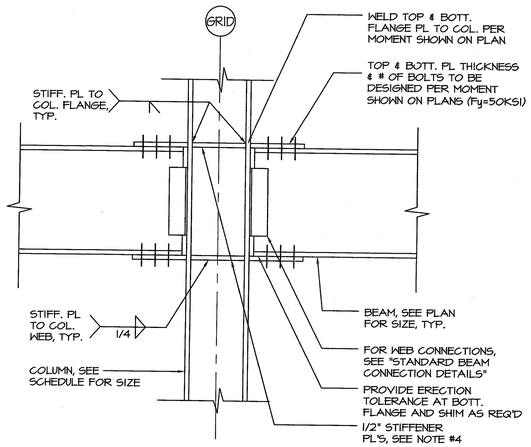
PC-2
PC2 DEPTH - 34"



PC-6
PC6 DEPTH - 34"



PC-6A
PC6 DEPTH - 34"



BEAM TO COLUMN FLANGE

NOTES:
1. LOCATIONS OF BEAM TO COLUMN MOMENT CONNECTIONS SHOWN THUS ▶—1 ON FRAMING PLANS.
2. AT COLUMNS WITH STIFFENER PLATES, BEAMS CONNECTING TO COLUMN WEB SHALL USE SHEAR PLATE CONNECTION DESIGNED AS SPECIFIED IN NOTE #5 OF "STANDARD BEAM CONNECTION DETAILS".
3. ALL BOLTS TO BE 3/4"Φ A325 HIGH STRENGTH BOLTS, UNLESS NOTED OTHERWISE. ALL WELDING SHALL BE DONE USING ETOXX ELECTRODES.
4. PROVIDE FULL DEPTH STIFFENER PLATES ON BOTH SIDES OF COLUMN WEB WHERE INDICATED ON COLUMN SCHEDULE. WIDTH OF PLATE SHALL BE (bfb - twc)/2 + 1/4" MINIMUM. ALL STIFFENER PLATES TO BE GRADE 50 (Fy = 50 KSI).
5. WHERE STIFFENER PLATES ARE REQUIRED FOR A BEAM TO COLUMN FLANGE CONNECTION AT THE SAME LOCATION AS A BEAM TO COLUMN WEB CONNECTION, USE THE MORE STRINGENT STIFFENER PLATE AND WELDING REQUIREMENTS.
6. PROVIDE STIFFENER PLATES ON BOTH SIDES OF COLUMN WEB WHEN MOMENT CONNECTION IS ONLY REQUIRED ON ONE SIDE OR BEAMS ARE OF DIFFERENT DEPTHS (Fy=50KSI)
7. TERMINATE WELD A DISTANCE EQUAL TO THE WELD SIZE AT THE EDGE OF THE STIFFENER PLATE AND THE COLUMN FLANGE.

- BEAM TO COLUMN MOMENT CONNECTION DETAILS
SCALE : 3/4" = 1'-0"

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NJ State Board of Architects Authorization No. 165
NJ State Board of Engineers & Land Surveyors Authorization No. 0A/27877

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
SC	RAB

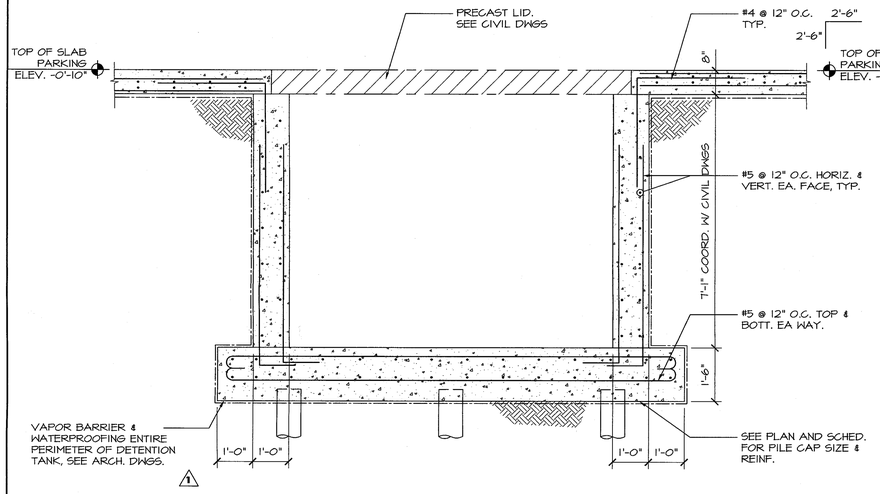
Drawing Name:
ELEVATIONS, COLUMN SCHEDULE, AND TYPICAL DETAILS

Drawing Number:
S-202

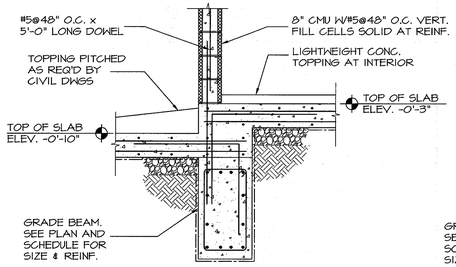
SHEET19of 102

Initial Date:

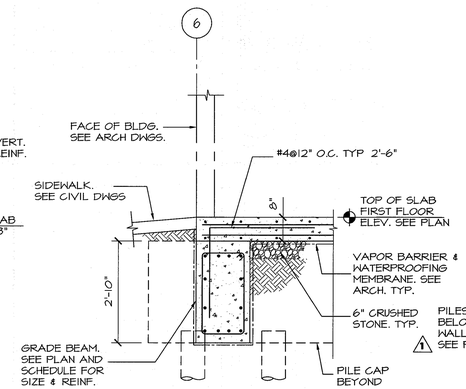
REGISTERED ARCHITECT — MATTHEW B. JARMEL — No. 21AI018294 — STATE OF NEW YORK



4 SECTION THRU DETENTION TANK
SCALE : 1/2" = 1'-0"



3 SECTION AT SLAB STEP
SCALE : 1/2" = 1'-0"



2 SECTION
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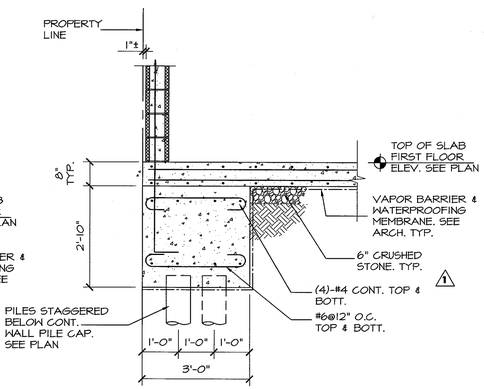

1 SECTION
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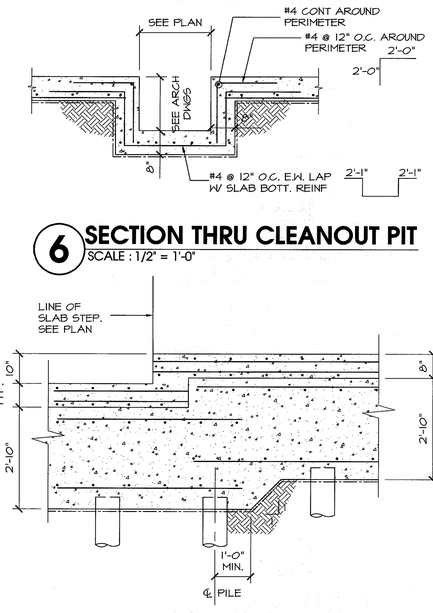
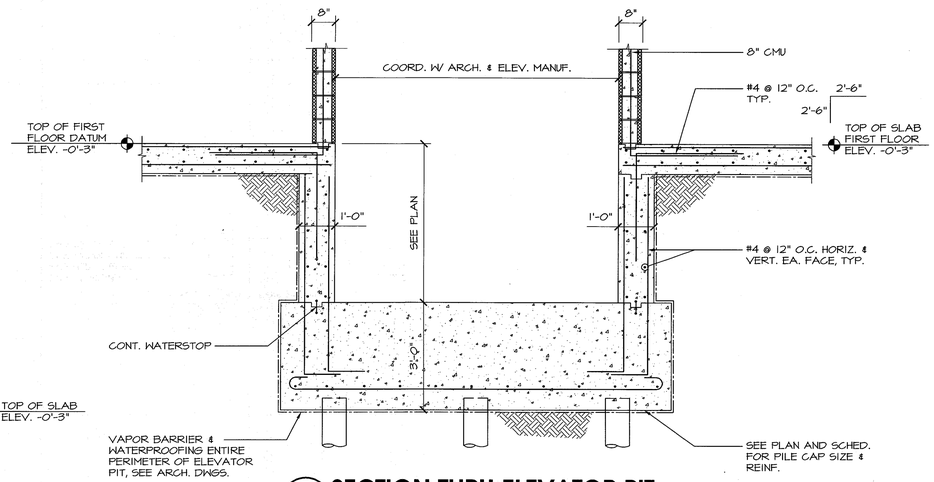


6 SECTION THRU CLEANOUT PIT
SCALE : 1/2" = 1'-0"



5 SECTION THRU ELEVATOR PIT
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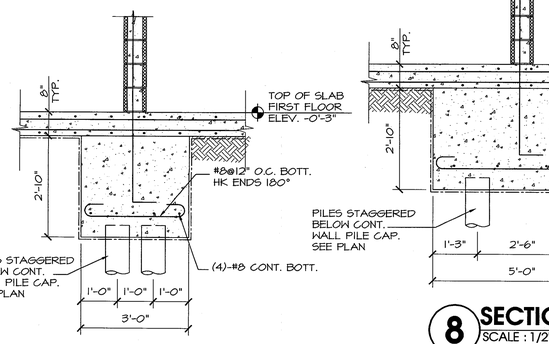
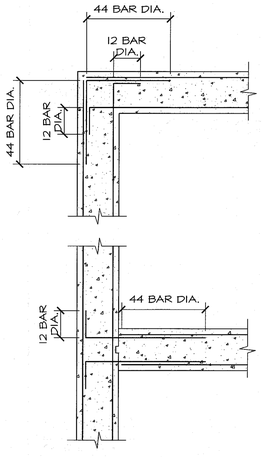


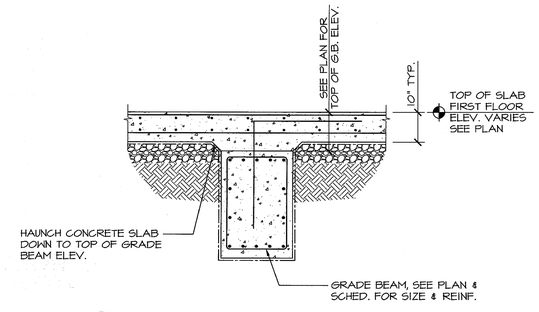
9 SECTION
SCALE : 1/2" = 1'-0"

8 SECTION
SCALE : 1/2" = 1'-0"

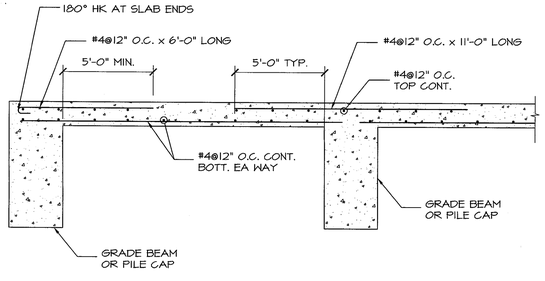
7 SECTION AT PILE CAP STEP
SCALE : 1/2" = 1'-0"



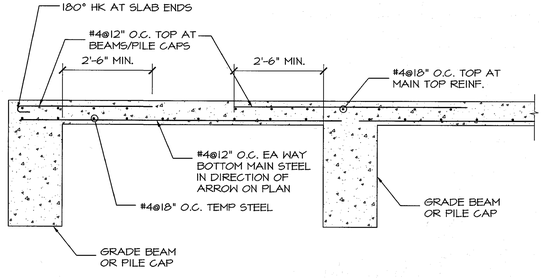
TYPICAL WALL INTERSECTION/ CORNER REINFORCING DETAIL
SCALE : 1/2" = 1'-0"



10 DROPPED GRADE BEAM DETAIL
SCALE : 1/2" = 1'-0"



SLAB S-2 REINFORCING TWO-WAY SLAB
SCALE : 1/2" = 1'-0"



SLAB S-1 REINFORCING ONE-WAY SLAB
SCALE : 1/2" = 1'-0"

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FREDRICK KINCAID, RA — NJ LIC 21AI018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA027817

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

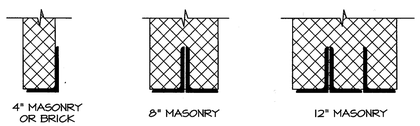
Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
SC	RAB

Drawing Name:
FOUNDATION SECTIONS

Drawing Number:
S-300

Initial Date:

REGISTERED ARCHITECT MATTHEW R. JARMEL 24673 NEW YORK



4" MASONRY OR BRICK

8" MASONRY

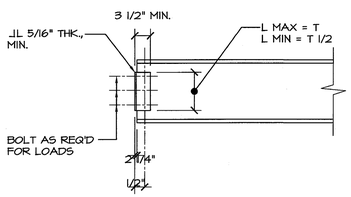
12" MASONRY

LOOSE LINTEL SCHEDULE			
MASONRY OPENING	4 INCH WALL	8 INCH WALL	12 INCH WALL
UP TO 4'-0"	L3 1/2x3 1/2x1/4	(2) L3 1/2x3 1/2x1/4	(3) L3 1/2x3 1/2x1/4
OVER 4'-0" TO 6'-0"	L4x3 1/2x1/4	(2) L4x3 1/2x1/4	(3) L4x3 1/2x1/4
OVER 6'-0" TO 7'-0"	L5x3 1/2x5/16	(2) L5x3 1/2x5/16	(3) L5x3 1/2x5/16
OVER 7'-0" TO 8'-0"	L6x3 1/2x5/16	(2) L6x3 1/2x5/16	(3) L6x3 1/2x5/16

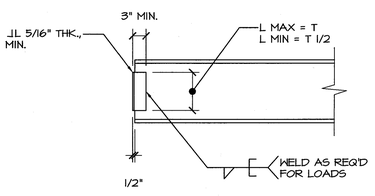
NOTES:
1. ALL ANGLES ARE TO BE LONG LEG VERTICAL, UNLESS OTHERWISE NOTED.
2. ALL EXTERIOR LOOSE LINTELS SHALL BE HOT-DIPPED GALVANIZED.
3. PROVIDE MINIMUM 6" BEARING AT EACH END OF OPENING.
4. CONTRACTOR SHALL SUBMIT WITH THE ERECTION PLANS A COMPLETE SCHEDULE OF LOOSE LINTELS, INDICATING MARK, MASONRY OPENING, ANGLE SIZE, LENGTH, AND LOCATIONS.
5. COORDINATE ALL REQUIRED WALL OPENINGS WITH ARCHITECTURAL AND MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS.

TYPICAL LOOSE LINTEL SCHEDULE

SCALE: N.T.S.



SHOP BOLTED CONNECTION



SHOP WELDED CONNECTION

NOTES:
1. ALL CONNECTIONS SHALL BE DESIGNED IN ACCORDANCE WITH THE LATEST AISC SPECIFICATIONS USING ALLOWABLE STRESS DESIGN.
2. REACTIONS SHOWN ON PLAN ARE DUE TO UNFACTORED SERVICE LOADS.
3. FABRICATOR SHALL SUBMIT STANDARD CONNECTION DETAILS FOR APPROVAL WITH STEEL ERECTION DRAWING SUBMISSION.
4. AT CONNECTION OF BEAM TO END OF CANTILEVER BEAM, PROVIDE STANDARD DOUBLE ANGLE CONNECTION WITH CAPACITY FOR REQUIRED LOADS.
5. WHERE BEAMS FRAME TO FITTED STIFFENERS AT COLUMNS, PROVIDE SHEAR PLATE CONNECTION WITH CAPACITY FOR REQUIRED LOADS.
6. ALL BOLTS TO BE A325 HIGH STRENGTH BOLTS, IN BEARING TYPE 'N' CONNECTION, UNLESS OTHERWISE NOTED ON DRAWINGS.
7. ALL WELDING ELECTRODES TO BE E70XX.
8. USE DOUBLE BENT PLATE CONNECTION AS REQUIRED FOR SKEWED FRAMING CONDITIONS.
9. WHERE SINGLE PLATE CONNECTIONS ARE USED AT BEAM TO COLUMN CONNECTIONS, DESIGN TO ELIMINATE MOMENT DUE TO ECCENTRICITY TRANSFER TO COLUMN (I.E. EXTENDED SINGLE-PLATE SHEAR CONNECTION PROCEDURE.)

- STANDARD BEAM CONNECTION DETAILS

SCALE : 3/4" = 1'-0"

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ARCHITECTS AND ENGINEERS INC.
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Engineering
Interior Design
Implementation Services

ISSUE

NO.	DATE	DESCRIPTION	INT.
01	03.19.15	FILING & PRICING	MBJ

REVISION

NO.	DATE	DESCRIPTION	INT.

PRINCIPALS:
MATTHEW R. JARMEL AIA, MBA
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CO LIC ARC-401483 | MI LIC 1301051189
DC LIC ARC-101849 | MN LIC 46404
DE LIC S5-00007256 | NC LIC 10120
FL LIC AR94034 | NH LIC 3501
GA LIC RA011484 | NY LIC 024673
IA LIC 05577 | OH LIC A-99-12444
IL LIC 001.020069 | PA LIC RA-014851-B
MA LIC AR10286 | TN LIC 103850
MD LIC 12662 | TX LIC 20992
VA LIC 0401.014089
VT LIC 2452
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CT LIC 08522 | NJ LIC PP LIC 33LI00243100
RICHARD A. JARMEL, PE NJ LIC 37491
CT LIC PEN0027735 | MN LIC 47482
FL LIC 70134 | NY LIC 0738898-1
MI LIC 6201052339 | PA LIC PE079600
DE LIC 18754 | MA LIC 50445
VT LIC 88498
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NJ LIC 21AI0012660
FREDRICK KINCAID, RA NJ LIC 21AI0018294

NJ State Board of Architects Authorization No. 161
NJ State Board of Engineers & Land Surveyors Authorization No. GA-298177

10/03/2013

Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By:	**Approved By:**
SC	RAB

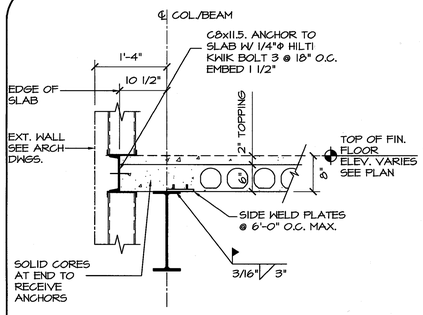
Drawing Name:
FRAMING DETAILS

Drawing Number:
S-400

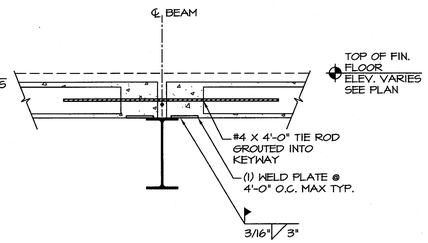
SHEET21of 102

Initial Date:

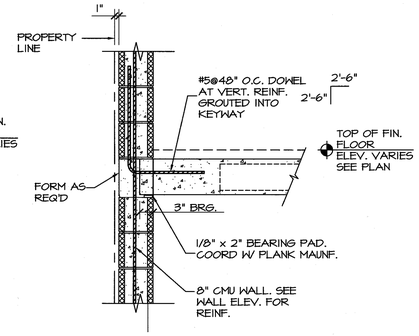
REGISTERED ARCHITECT MATTHEW R. JARMEL STATE OF NEW YORK



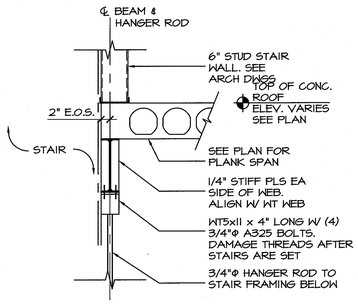
1 SECTION AT EXT. WALL
SCALE : 3/4" = 1'-0"



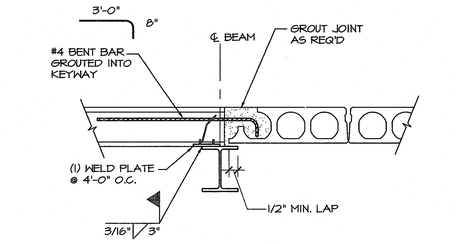
2 INTERIOR BEARING ON STEEL
SCALE : 3/4" = 1'-0"



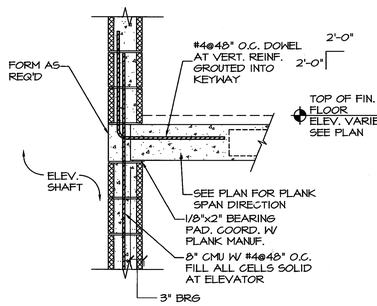
3 SECTION AT SIDE WALL
SCALE : 3/4" = 1'-0"



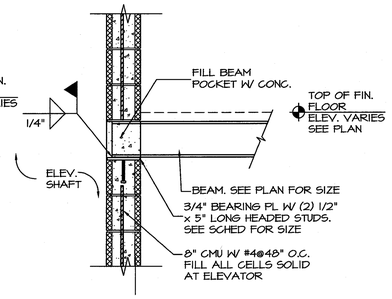
4 SECTION AT INTERIOR STAIR WALL
SCALE : 3/4" = 1'-0"



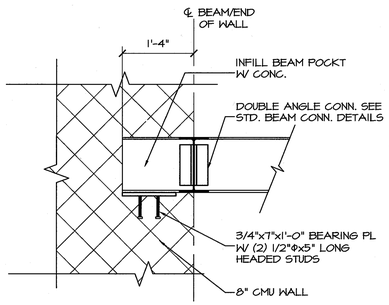
5 INTERIOR CHANGE OF DIRECTION
SCALE : 3/4" = 1'-0"



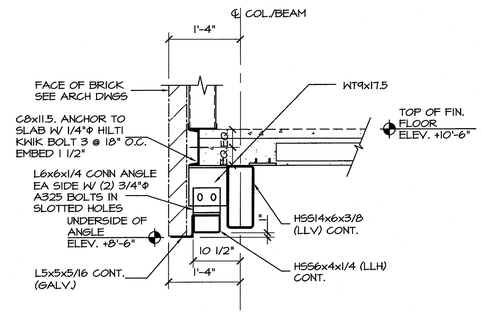
TYPICAL SECTION



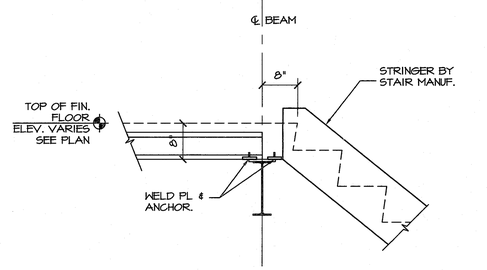
AT BEAM BEARING



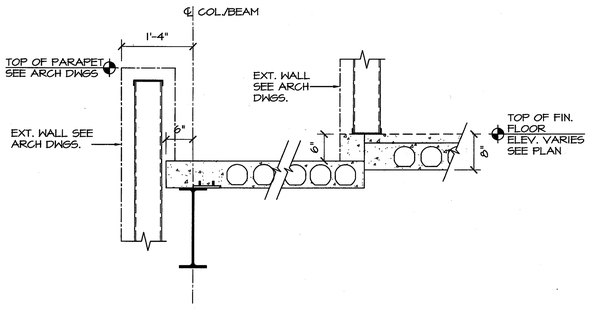
7 SECTION
SCALE : 3/4" = 1'-0"



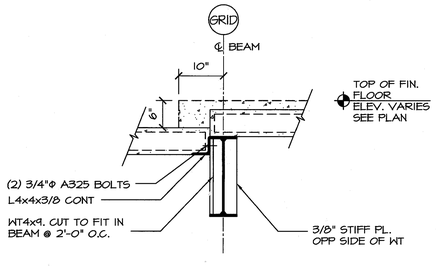
8 SECTION
SCALE : 3/4" = 1'-0"



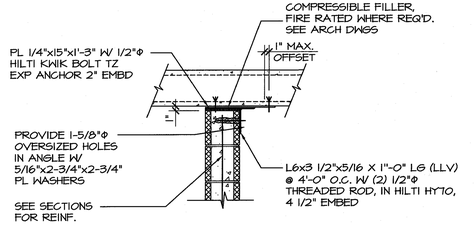
9 SECTION AT STAIR LANDING
SCALE : 3/4" = 1'-0"



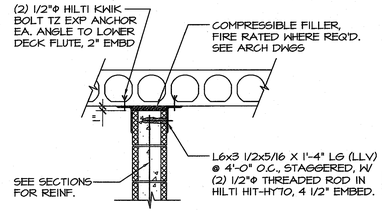
10 SECTION AT BALCONY
SCALE : 3/4" = 1'-0"



11 SECTION AT SLAB STEP
SCALE : 3/4" = 1'-0"



PARALLEL TO PLANK



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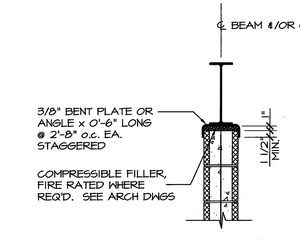
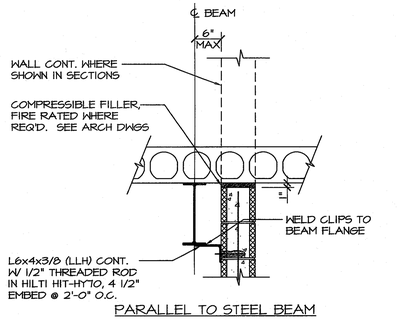


UNDER STEEL BEAM



PARALLEL TO STEEL BEAM

TO BE USED UNLESS SHOWN OTHERWISE ON SECTION.
TO BE SUPPLIED BY STRUCTURAL STEEL CONTRACTOR

- TYPICAL CMU WALL BRACING DETAILS
SCALE : 3/4" = 1'-0"

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PRINCIPALS:
MATTHEW B. JARMEL AIA, MBA — AZ LIC 48159; CO LIC ARC-401483; DC LIC ARC-101849; DE LIC S5-0000256; FL LIC AR94034; GA LIC RA011484; IA LIC 05577; IL LIC 001.020069; MA LIC AR10286; MD LIC 12662; NJ LIC A10-12787; MI LIC 1301052189; MN LIC 46404; NC LIC 10120; NH LIC 3501; NY LIC 034673; OH LIC A-99-12444; PA LIC RA-014851-B; TN LIC 103850; TX LIC 20992; VA LIC 0401 014089; VT LIC 2483
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NJ State Board of Architects Authorization No. 161
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Project:
387 MANHATTAN AVE
BROOKLYN, NEW YORK

Project Number:	Scale:
CAPSTN-S-14-193	AS NOTED
Drawn By: SC	**Approved By:** RAB

Drawing Name:
FRAMING DETAILS

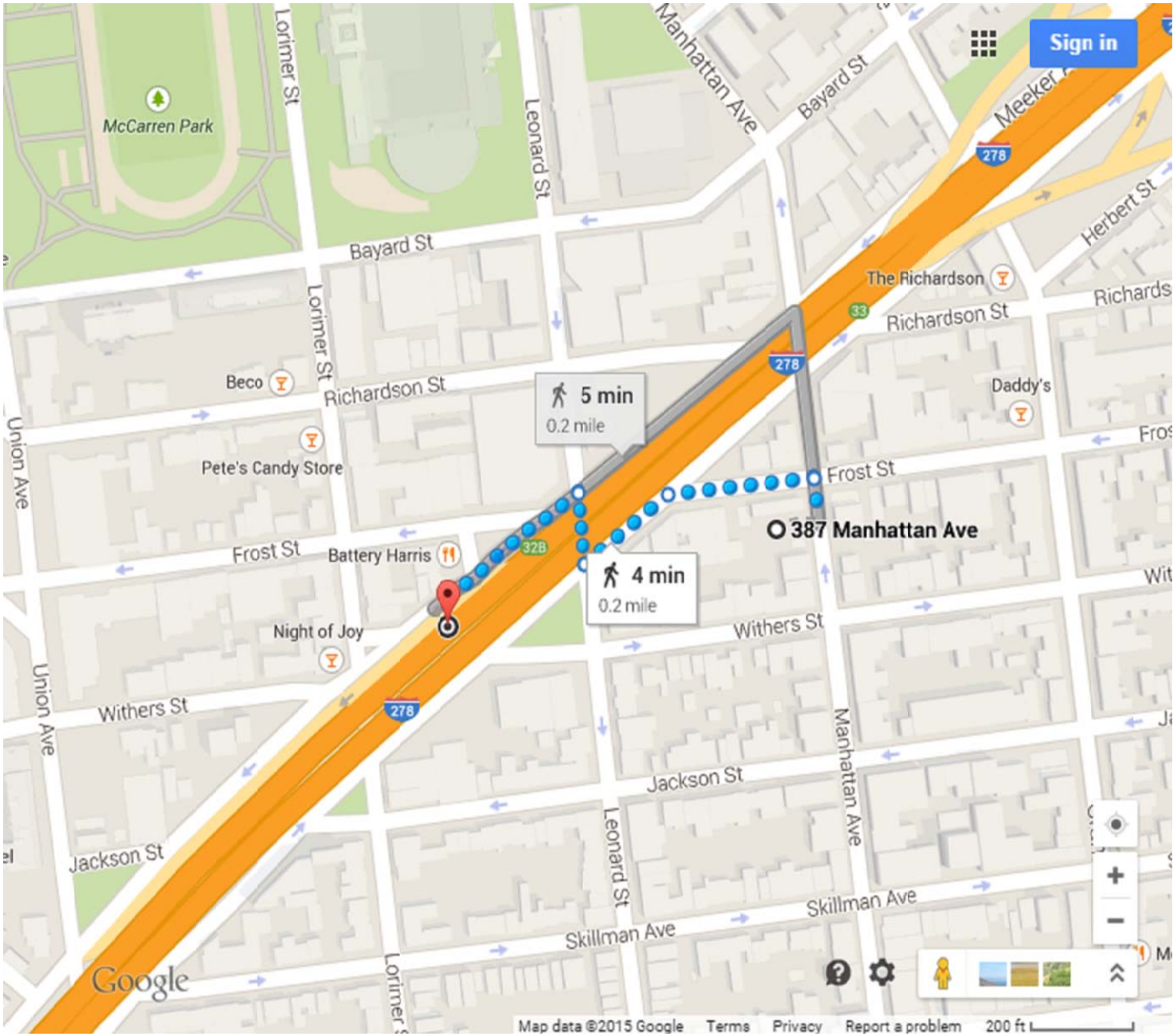
Drawing Number:
S-401

SHEET22of 102

Initial Date:

REGISTERED ARCHITECT — MATTHEW B. JARMEL — LIC. NO. 24673 — STATE OF NEW YORK

Appendix 9
Truck Route



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387 Manhattan Avenue
Brooklyn, NY.
HTE Job # 150075

Drawn By: C.Q.
Reviewed By: M.R
Approved By: M.R
Date: 01/08/15
Scale: AS NOTED

TITLE:

APPENDIX 9: TRUCK ROUTE

387 MANHATTAN AVENUE

BROOKLYN, NEW YORK

Remedial Action Work Plan

NYC VCP Number: 15CVCP095K
NYC E Project Number: 12EHAZ200K

Prepared for:

AB Capstone

387 Manhattan Avenue, Brooklyn NY

(718) 480-4444

Prepared by:

Hydro Tech Environmental, Corp.

15 Ocean Avenue, 2nd Floor, Brooklyn, New York

(718) 636-0800

MARCH 2015

REMEDIAL ACTION WORK PLAN
TABLE OF CONTENTS

FIGURES

APPENDICES

LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
VCA	Voluntary Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC VCP	New York City Voluntary Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PE	Professional Engineer
PID	Photo Ionization Detector

QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semi-Volatile Organic Compound
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

CERTIFICATION

I, Shaik Saad , am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 387 Manhattan Avenue Site 15CVCP095K

I, Mark E. Robbins am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the 387 Manhattan Avenue Site 15CVCP095K.

I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

SHAIK SAAD

Name

071078

NYS PE License Number

Signature

3/24/15

Date

Mark E. Robbins

QEP Name

QEP Signature

3/24/15

Date

EXECUTIVE SUMMARY

AB Capstone has applied to enroll in the New York City Voluntary Brownfield Cleanup Program (NYC VCP) to investigate and remediate a 5,000-square foot site located at 387 Manhattan Avenue in Brooklyn, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 387 Manhattan Avenue in the East Williamsburg section of Brooklyn, New York and is identified as Block 2738 and Lot 21 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 5,000-square feet and is bounded by a multi-story residential & commercial building to the north, a multi-story residential building to the south, Manhattan Avenue to the east and residential buildings to the west. Currently, the Site is utilized as a parking lot and contains no buildings.

Summary of Proposed Redevelopment Plan

The proposed future use of the Site consists of a 6-story mixed-use commercial, artists loft and residential building with no basement. Excavation to 2 feet bgs will be required across the proposed building footprint for a new slab on grade. Excavation to 5 feet below grade will be required in the elevator pit area. The building is approximately 3,000 square feet with approximately 19,000 square feet of floor area for artist loft/residential use and 500 square feet of floor area for retail commercial use. An asphalt parking lot approximately 1,750 square feet will be located in the western portion of the site. The first floor of the building consists of a mechanical storage area, a lobby and retail space. The second and third floor of the building consist of 8 artists loft spaces (4 loft spaces per floor). The fourth, fifth and sixth floor of the building consist of 12 residential units (4 units per floor). Layout of the proposed site

development is presented in Figure 3. The current zoning designation is M1-2/R6/MX-8. The proposed use is consistent with existing zoning for the property.

The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

Summary of Environmental Findings

1. Elevation of the property is 16 feet.
2. Depth to groundwater at the Site is 5.2 feet.
3. Groundwater flow is generally northwest beneath the Site.
4. The stratigraphy of the Site, from the surface down to approximately 7 feet below grade consists of fill material underlain by a mixture of brown sand with silt.
5. Soil/fill samples collected during the RI were compared to the 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs) (Track 1) as well as to Restricted Residential Use SCOs (Track 2). No PCBs or Pesticides were detected in any of the soil samples. No VOCs were detected above Unrestricted Use SCOs. Only acetone was detected at trace levels in one deep sample at a concentration below its Unrestricted Use SCO. . Eight Polycyclic Aromatic Hydrocarbon (PAH)-range SVOCs including Benzo(a)anthracene (max. of 28.5 ppm), Benzo(a)pyrene (max. of 22.4 ppm), Benzo(b)fluoranthene (max. of 21.2 ppm), Benzo(k)fluoranthene (max. of 27.3 ppm), Chrysene (max. of 106 ppm), Dibenzo(a,h)anthracene (max. of 14.9), Indeno(1,2,3-cd)pyrene (max. of 20 ppm) and Pyrene (max. of 110 ppm) were detected in two shallow soil samples at concentrations exceeding their respective Restricted Residential Use SCOs.. Metals including Arsenic (max. of 24.10 ppm), Barium (max. of 422 ppm), Chromium Trivalent (max. of 40.60), Copper (max. of 606 ppm), Lead (max. of 3,310 ppm) and Mercury (max. of 21.20 ppm) were detected in three shallow soil samples at concentrations exceeding their Restricted Residential Use SCOs. Most of metal as well as SVOC exceedances were detected in soil boring SP-1 at 0 to 2 feet depths, indicating SP-1 is a hotspot for SVOCs and metals.

6. Groundwater sample results from the RI were compared to New York State 6NYCRR Part 703.5 Class GA Groundwater Quality Standards (GQS). No VOCs, PCBs, or pesticides were detected in any of the groundwater samples. Four SVOCs including Benzo(a)anthracene (max. of 0.0821 µg/L), Benzo(a)pyrene (max. of 0.0615 µg/L), Benzo(b)fluoranthene (max. of 0.0718 µg/L) and Benzo(k)fluoranthene (max. of 0.0615 µg/L) were detected in two groundwater samples at concentrations exceeding their respective GQS. Several metals were identified, but only Magnesium (max. 45,900 µg/L), Manganese (max. 1,020 µg/L) and Sodium (max. 87,400 µg/L) were detected in the dissolved groundwater samples at concentrations exceeding their respective GQS.

7. Soil vapor results collected during the RI were compared to the compounds listed in Vapor Intrusion Matrices in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion dated October 2006. Soil vapor results show petroleum related VOCs (BTEX) and associated derivatives in all three samples. The petroleum related compounds range in concentration from 0.49 µg/m^3 to 15 µg/m^3. Petroleum related compounds were also detected in the ambient air collected during the RI, at a maximum of 2.7 µg/m^3. Chlorinated compounds including 1,1,1-Trichloroethane (TCA) was detected in one of the four soil vapor samples at a concentration. of 2.5 ug/m^3. Tetrachloroethylene (PCE) was detected in three samples at concentrations ranging from 0.61 to8 ug/m^3. Carbon tetrachloride and trichloroethylene (TCE) were not dectected in any of the four samples. The PCE and TCA concentrations are below the monitoring level ranges established within the State NYS DOH soil vapor guidance matrix. Other VOCs that were identified in the soil vapor samples include Acetone (max. of 15 µg/m^3), Methylene Chloride (max. 2.8 ug/m^3) and Chloroform (max. of 0.54 ug/m^3). Acetone (max. of 6.8 ug/m^3) and Methylene Chloride (max. of 2.1 ug/m^3) were also detected in the ambient air.

Summary of the Remedy

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and

guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.

2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.

3. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility. A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to start of remedial action.

4. Selection of NYSDEC 6NYCRR Part 375 Site Specific (Track 4) Soil Cleanup Objectives (SCOs).

5. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.

6. Excavation and removal of soil/fill exceeding Track 4 Site-Specific SCOs. For development purposes, excavation within the new building slab will extend approximately 2 feet below ground surface (bgs). An elevator shaft area will be excavated to a depth of 5 feet. If soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation after removal of all soil required for construction of the buildings is complete, additional excavation will be performed to meet Track 4 Site-Specific SCOs. Approximately 600 tons of contaminated soil will be excavated and removed from this Site.

7. Excavation and removal of soils in hotspot area around soil boring SP-1 in parking lot area to meet Track 4 SCOs.

8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
9. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
10. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations.
11. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite.
12. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
13. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
14. Installation of a vapor barrier/waterproofing membrane system below the slab on-grade portion of the building, as well as behind subgrade portions of foundation walls of the proposed building.
15. Construction and maintenance of an engineered composite cover consisting of the concrete building slab to prevent human exposure to residual soil/fill remaining under the Site.
16. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
17. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

18. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.

19. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.

20. The property will continue to be registered with an E-Designation by the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls in this RAWP and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

COMMUNITY PROTECTION STATEMENT

The Office of Environmental Remediation created the New York City Voluntary Cleanup Program (NYC VCP) to provide governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan ("cleanup plan") describes the findings of prior environmental studies that show the location of contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities and also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

Remedial Investigation and Cleanup Plan. Under the NYC VCP, a thorough cleanup study of this property (called a remedial investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

Identification of Sensitive Land Uses. Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

Qualitative Human Health Exposure Assessment. An important part of the cleanup planning for the Site is the performance of a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

Health and Safety Plan. This cleanup plan includes a Construction Health and Safety Plan (CHASP) that is designed to protect community residents and on-Site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration (OSHA). This plan includes many protective elements including those discussed below.

Site Safety Coordinator. This project has a designated Site safety coordinator to implement the Health and Safety Plan. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is Holly Hawkins and can be reached at (631)-457-0033.

Worker Training. Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

Community Air Monitoring Plan. Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan or CAMP. Results will be regularly reported to the NYC OER. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a 'Contingency Plan').

Odor, Dust and Noise Control. This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager Holly Hawkins 631-457-0033 or NYC Office of Environmental Remediation Project Manager Rebecca Bub (212)-341-2073.

Quality Assurance. This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be

summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

Storm-Water Management. To limit the potential for soil erosion and discharge, this cleanup plan has provisions for storm-water management. The main elements of the storm water management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

Hours of Operation. The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation are 7am-5pm Monday-Friday.

Signage. While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC Voluntary Cleanup Program, provides project contact names and numbers, and locations of project documents can be viewed.

Complaint Management. The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager Holly Hawkins at (631)-457-0033., the NYC Office of Environmental Remediation Project Manager Rebecca Bub at (212)-341-2073, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

Utility Mark-outs. To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC Department of Buildings regulations.

Soil and Liquid Disposal. All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations and required permits will be obtained.

Soil Chemical Testing and Screening. All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held

instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

Stockpile Management. Soil stockpiles will be kept covered with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed to protect storm water catch basins and other discharge points.

Trucks and Covers. Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with all laws and regulations.

Imported Material. All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on-Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

Equipment Decontamination. All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

Housekeeping. Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

Truck Routing. Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

Final Report. The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document repositories located at Brooklyn Public Library.

Long-Term Site Management. If long-term protection after the cleanup is required, the property owner may be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined in the property's deed or established through a city environmental designation. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

AB Capstone has applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property located at 387 Manhattan Avenue in the East Williamsburg section of Brooklyn, New York (the "Site"). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 SITE LOCATION AND CURRENT USAGE

The Site is located at 387 Manhattan Avenue in the East Williamsburg section of Brooklyn, New York and is identified as Block 2738 and Lot 21 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 5,000-square feet and is bounded by a multi-story residential & commercial building to the north, a multi-story residential building to the south, Manhattan Avenue to the east and residential buildings to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is utilized as a parking lot and contains no buildings.

1.2 PROPOSED REDEVELOPMENT PLAN

The proposed future use of the Site consists of a 6-story mixed-use commercial, artists loft and residential building with no basement. Excavation to 2 feet bgs will be required across the proposed building footprint for a new slab on grade. Excavation to 5 feet below grade will be required in the elevator pit area. The building is approximately 3,000 square feet with approximately 19,000 square feet of floor area for artist loft/residential use and 500 square feet of floor area for retail commercial use. An asphalt parking lot approximately 1,750 square feet

will be located in the western portion of the site. The first floor of the building consists of a mechanical storage area, a lobby and retail space. The second and third floor of the building consist of 8 artists loft spaces (4 loft spaces per floor). The fourth, fifth and sixth floor of the building consist of 12 residential units (4 units per floor). Layout of the proposed site development is presented in Figure 3. The current zoning designation is M1-2/R6/MX-8. The proposed use is consistent with existing zoning for the property.

The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

The area surrounding the Site consists of residential and commercial properties. Multi-story residential buildings are located adjacent to the south, east and west of the Site. A multi-story residential and commercial building, occupied by a dentist office, is located adjacent to the north of the Site. The ground surfaces in the vicinity of the Site consist of asphalt and concrete. Two sensitive receptors, National Health Laboratories Inc. and School Settlement Association, are located within a ⅛-mile radius of the Site. The Site should not impact upon these sensitive receptors.

Figure 4 shows the surrounding land usage.

1.4 REMEDIAL INVESTIGATION

A remedial investigation was performed and the results are documented in a companion document called "*Remedial Investigation Report, 387 Manhattan Avenue*", dated February, 2015 (RIR).

Summary of Past Uses of Site and Areas of Concern

Based upon the review of Sanborn Fire Rate Insurance Maps, Property Shark, the City Directory and the NYC Automated City Register Information System (ACRIS) database for the Subject Property and its vicinity and the Phase I Environmental Site Assessment (ESA) Report prepared by Hydro Tech Environmental, Corp. dated November 2014, a site history was established. The site was developed prior to 1905 as a junkyard and 1-story rag manufacturing

building. A 1-story building identified as Junk, a 2-story rag manufacturing building and a 2-story unspecified building was then constructed during 1916. A 1-story garage & repair shop with a gasoline tank was then constructed between 1942 and 1951. The site then operated as a 1-story woodworking building between 1965 and 2007. The 1-story woodworking building was demolished between 2007 and 2014. Currently the site has no buildings and is being used as a parking lot as observed during the site inspection.

The AOCs identified for this site include:

1. The historic use of the Subject Property as a junkyard, rag manufacturer, garage with a gasoline tank on site and wood-working shop;
2. The presence of a Potential Vapor Encroachment Condition at the Subject Property;
3. The presence of a HazMat E-Designation on the Subject Property;
4. The presence of a monitoring well;

Summary of the Work Performed under the Remedial Investigation

Hydro Tech Environmental, Corp. performed the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed three (3) soil borings across the entire project Site, and collected six (6) soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed three (3) groundwater monitoring wells throughout the Site and collected three (3) groundwater samples for chemical analysis to evaluate groundwater quality;
4. Installed four (4) soil vapor probes throughout the Site and collected four (4) samples for chemical analysis.
5. One (1) outdoor air sample was collected for chemical analysis.

Summary of Environmental Findings

1. Elevation of the property is 16 feet.
2. Depth to groundwater at the Site is 5.2 feet.

3. Groundwater flow is generally northwest beneath the Site.

4. The stratigraphy of the Site, from the surface down to approximately 7 feet below grade consists of fill material underlain by a mixture of brown sand with silt.

5. Soil/fill samples collected during the RI were compared to the 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs) (Track 1) as well as to Restricted Residential Use SCOs (Track 2). No PCBs or Pesticides were detected in any of the soil samples. No VOCs were detected above Unrestricted Use SCOs. Only acetone was detected at trace levels in one deep sample at a concentration below its Unrestricted Use SCO. . Eight Polycyclic Aromatic Hydrocarbon (PAH)-range SVOCs including Benzo(a)anthracene (max. of 28.5 ppm), Benzo(a)pyrene (max. of 22.4 ppm), Benzo(b)fluoranthene (max. of 21.2 ppm), Benzo(k)fluoranthene (max. of 27.3 ppm), Chrysene (max. of 106 ppm), Dibenzo(a,h)anthracene (max. of 14.9), Indeno(1,2,3-cd)pyrene (max. of 20 ppm) and Pyrene (max. of 110 ppm) were detected in two shallow soil samples at concentrations exceeding their respective Restricted Residential Use SCOs. Metals including Arsenic (max. of 24.10 ppm), Barium (max. of 422 ppm), Chromium Trivalent (max. of 40.60), Copper (max. of 606 ppm), Lead (max. of 3,310 ppm) and Mercury (max. of 21.20 ppm) were detected in three shallow soil samples at concentrations exceeding their Restricted Residential Use SCOs. Most of metal as well as SVOC exceedances were detected in soil boring SP-1 at 0 to 2 feet depths, indicating SP-1 is a hotspot for SVOCs and metals.

6. Groundwater sample results from the RI were compared to New York State 6NYCRR Part 703.5 Class GA Groundwater Quality Standards (GQS). No VOCs, PCBs, or pesticides were detected in any of the groundwater samples. Four SVOCs including Benzo(a)anthracene (max. of 0.0821 µg/L), Benzo(a)pyrene (max. of 0.0615 µg/L), Benzo(b)fluoranthene (max. of 0.0718 µg/L) and Benzo(k)fluoranthene (max. of 0.0615 µg/L) were detected in two groundwater samples at concentrations exceeding their respective GQS. Several metals were identified, but only Magnesium (max. 45,900 µg/L), Manganese (max. 1,020 µg/L) and Sodium (max. 87,400 µg/L) were detected in the dissolved groundwater samples at concentrations exceeding their respective GQS.

7. Soil vapor results collected during the RI were compared to the compounds listed in Vapor Intrusion Matrices in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion dated October 2006. Soil vapor results show petroleum related VOCs (BTEX) and associated derivatives in all three samples. The petroleum related compounds range in concentration from 0.49 $\mu g/m^3$ to 15 $\mu g/m^3$. Petroleum related compounds were also detected in the ambient air collected during the RI, at a maximum of 2.7 $\mu g/m^3$. Chlorinated compounds including 1,1,1-Trichloroethane (TCA) was detected in one of the four soil vapor samples at a concentration. of 2.5 ug/m^3. Tetrachloroethylene (PCE) was detected in three samples at concentrations ranging from 0.61 to 8 ug/m^3. Carbon tetrachloride and trichloroethylene (TCE) were not dectected in any of the four samples. The PCE and TCA concentrations are below the monitoring level ranges established within the State NYS DOH soil vapor guidance matrix. Other VOCs that were identified in the soil vapor samples include Acetone (max. of 15 $\mu g/m^3$), Methylene Chloride (max. 2.8 ug/m^3) and Chloroform (max. of 0.54 ug/m^3). Acetone (max. of 6.8 ug/m^3) and Methylene Chloride (max. of 2.1 ug/m^3) were also detected in the ambient air.

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

2.0 REMEDIAL ACTION OBJECTIVES

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

Groundwater

- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to contaminants volatilizing from contaminated groundwater.

Soil

- Prevent direct contact with contaminated soil.
- Prevent exposure to contaminants volatilizing from contaminated soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

- Prevent exposure to contaminants in soil vapor.
- Prevent migration of soil vapor into dwelling and other occupied structures.

3.0 REMEDIAL ALTERNATIVES ANALYSIS

The goal of the remedy selection process under is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). A remedy is then developed based on the following ten criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community acceptance;
- Land use; and
- Sustainability

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. As required, a minimum of two remedial alternatives (Alternative #1 and Alternative #2) are considered for alternatives analysis for this site:

Alternative #1 involves:

- Selection of 6NYCRR Part 375 Table 6.8 (a) Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
- Removal of all soil/fill exceeding Track 1 SCOs throughout the Site and confirmation

that Track 1 SCOs have been achieved with post-excavation endpoint sampling. The site would have to be excavated to 7 feet to achieve Track 1 SCOs. Then the site would have to be backfilled with clean Track 1 soil to bring it back up to two feet below grade for the proposed slab on grade building and parking area. If soil/fill-containing analytes at concentrations above Track 1 SCOs are still present at the base of the excavation, additional excavation will be performed to ensure complete removal of soil that does not meet Track 1 SCOs.

- No engineering or institutional controls are required in a Track 1 Unrestricted Use cleanup, a vapor barrier would be installed beneath the basement foundation and behind foundation sidewalls of the new building as a part of development to prevent any potential future exposures from off-Site soil vapor; and.
- Placement of a final cover over the entire Site as part of new development.

Alternative #2 involves:

- Establishment of Site Specific (Track 4) Soil Cleanup Objectives (SCOs).
- Removal of all soils exceeding Track 4 SCOs and confirmation that Track 4 has been achieved with post-excavation endpoint sampling. Excavation for construction of the new building's slab level would take place to a depth of approximately 2 feet below grade across the site and 5 feet below grade for the elevator pit. Therefore, if soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building is complete, additional excavation will be performed to meet Track 4 Site-Specific SCOs. A total estimated 600 tons of soil will be excavated and removed from the property. Additional excavations will be conducted in hot spot areas (SP-1) identified in parking areas.
- Installation of a vapor barrier beneath the foundation slab and along foundation side walls up to grade;
- Placement of a final cover over the entire site to eliminate exposure to remaining soil/fill;

- Establishment of use restrictions including prohibitions on the use of groundwater from the site and prohibitions on other sensitive site uses, such as farming or vegetable gardening, to eliminate future exposure pathways;
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of these engineering and institutional controls, including the performance of periodic inspections and certification that the controls are performing as they were intended; and
- Continued registration as an E-designated property to memorialize the remedial action and the Engineering and Institutional Controls required by this RAWP.

3.1 THRESHOLD CRITERIA

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative #1 would be protective of human health and the environment by removing the soil/fill exceeding Track 1 Unrestricted Use SCOs, thus eliminating the potential for human and environmental exposure to contaminated soil/fill once construction is complete and eliminating the risk of contamination leaching into groundwater. The vapor barrier would prevent any soil vapors from entering the new building.

Alternative #2 would achieve comparable protection of human health and the environment by excavating and removing soil/fill at the Site and by ensuring that remaining soil/fill on-Site meets Track 4 Site Specific SCOs, as well as by employing institutional and engineering controls, including a vapor barrier and a composite cover system. The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing institutional controls including a deed notice and a Site Management Plan would ensure that the composite

cover system remains intact and protective. Establishment of Track 4 Site-Specific SCOs would minimize the risk of contamination leaching into groundwater.

For both Alternatives, implementing a Construction Health and Safety Plan (CHASP), an approved Soils/Materials Management Plan (SMP) and Community Air Monitoring Plan (CAMP) would minimize potential exposure to contaminated soils during construction. Potential use of groundwater for potable supply would be prevented as city laws and regulations prohibit its use. The new building's basement slabs and vapor barrier would prevent potential future migration of off-Site soil vapors into the new buildings.

3.2. BALANCING CRITERIA

Compliance with Standards, Criteria and Guidance (SCGs)

This evaluation criterion assesses the ability of the alternative to achieve applicable standards, criteria and guidance.

Alternative #1 would achieve compliance with remedial goals, chemical-specific SCGs, and RAOs for soil through the removal of soil/fill to Track 1 Unrestricted Use SCOs and groundwater protection standards. Compliance with SCGs for soil vapor would also be achieved by installing a vapor barrier/waterproofing system below the new building's basement slab and continuing the vapor barrier around foundation walls, as part of development.

Alternative #2 would achieve compliance with remedial goals, chemical-specific SCGs, and RAOs for soil through the removal of soil/fill to Track 4 SCOs and groundwater protection standards and capping the Site with a composite cover. Compliance with SCGs for soil vapor could be achieved by installing a vapor barrier below the new building's cellar, as a part of development. A site management plan would ensure that these engineering controls remain protective for the long term.

Health and safety measures contained in the CHASP and Community Air Monitoring Plan (CAMP) that comply with the applicable SCGs shall be implemented during Site redevelopment under this RAWP. For both Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material

would be in compliance with the applicable SCGs. These measures would protect on-site workers and the surrounding community from exposure to Site-related contaminants.

Short-term effectiveness and impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

Both Alternatives 1 and 2 have similar-short term effectiveness during their respective implementations, as each requires excavation of soil/fill material. Both alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts would be higher for Alternative 1 since excavation of greater amounts of soil/fill material is required and a greater amount of backfill to bring the site back up to grade will be required.. However, focused attention to means and methods during the remedial action for an Alternative #1 removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities and any differences between these alternatives.

Both alternatives would employ appropriate measures to prevent short-term impacts, including a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-Site soil disturbance activities and would effectively prevent the release of significant contaminants into the environment. Both alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a Health and Safety Plan (CHASP) will be protected from on-Site contaminants (personal protective equipment would be worn consistent with the documented risks within the respective work zones).

Long-term effectiveness and permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of ECs/ICs that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of Engineering Controls.

Alternative 1 would achieve long-term effectiveness and permanence related to on-site contamination by permanently removing all impacted soils and enabling unrestricted usage of the property.

Alternative 2 would provide long-term effectiveness by removing most on-site contamination and attaining Track 4 SCOs, establishing engineering controls including a composite cover system across the entire site, establishing institutional controls to ensure long-term management including use restrictions, a Site Management Plan, and continued registration as an E-designated property to memorialize these controls for the long term. The Site Management Plan would ensure long-term effectiveness of all engineering controls and institutional controls by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended to and assuring that protections designed in the remedy would provide continued high levels of protection, in perpetuity.

Both alternatives would result in removal of soil contamination exceeding the SCOs providing the highest level, most effective and permanent remedy over the long-term with respect to a remedy for contaminated soil, which will eliminate any migration to groundwater. Potential sources of soil vapor and groundwater contamination would also be eliminated as part of the remedy.

Reduction of toxicity, mobility, or volume of contaminated material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their

principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

Alternative 1 would permanently eliminate the toxicity, mobility, and volume of contaminants from on-site soil by removing all soil in excess of unrestricted use SCOs.

Alternative 2 would permanently eliminate the toxicity, mobility, and volume of contaminants from on-site soil by removing soil in excess of Track 4 SCOs, and remaining soil/fill would meet Track 4 site specific SCOs.

Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

Both Alternatives are feasible and implementable. The techniques, materials and equipment to implement Alternative 1 and 2 are readily available and have been proven effective in remediating the contaminants associated with the Site. They use standard materials, services, and well-established technology. The reliability of these remedies is also high. There are no specific difficulties associated with any of the activities proposed, which utilize standard/industry methods.

Cost effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site

management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

Initial costs associated with Alternative 1 would be higher than Alternative 2 based on both the volume of soil that requires excavation and off-Site disposal costs, as well as the cost to bring in 5 feet of backfill material across the site. However, long-term costs for Alternative 2 are marginally higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2.

The remedial plan creates an approach that combines the remedial action with the redevelopment of the Site, including the construction of the building foundation and subgrade structures. The remedial plan is also cost effective in that it will take into consideration the selection of the closest and most appropriate disposal facilities to reduce transportation and disposal costs during the excavation of historic fill and other soils during the redevelopment of the Site.

Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

Based on the overall goals of the remedial program and initial observations by the project team, both of the alternatives are expected to be acceptable to the community. This RAWP will be subject to a public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. This public comment related only to site remediation will be considered by OER prior to approval of this plan. The Citizen Participation Plan for the project is provided in Appendix 1.

Land use

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas;

environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

Because of the complete soil removal proposed for the Alternative #1, it provides protection of public health and the environment for both the proposed use of the Site and any future use.

Alternative #1 provides a remedial action that is beneficial to the surrounding community and is consistent with the goals of the City for remediating and redeveloping brownfield sites. Alternative #2 also provides environmental and public health protection for the intended use. This alternative would allow the use of engineering controls and institutional controls that would provide protections against of site vapor migration.

Both alternatives for remedial action at the site are comparable with respect to the proposed use and to land uses in the vicinity of the Site. The proposed use is consistent with the existing zoning designation for the property and is consistent with recent development patterns. The Site is surrounded by commercial and residential properties and both alternatives provide comprehensive protection of public health and the environment for these uses. Improvements in the current environmental condition of the property achieved by both alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse. Both alternatives are equally protective of natural resources and cultural resources. This RAWP will be subject to public review under the NYC VCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

Sustainability of the Remedial Action

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources;

minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

Alternative #1 remediation would use the most energy and produce the most greenhouse gasses, as it would have the largest volume of material to truck off site, and largest amount of volume of backfill to bring back onsite. While Alternative #2 would result in lower energy use based on reducing the volume of material transported off-site, both remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. The remedial plan would take into consideration the shortest trucking routes during off-Site disposal of historic fill and other soils, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. New York City Clean Soil Bank program may be utilized for reuse of native soils. To the extent practicable, energy efficient building materials, appliances, and equipment will be utilized to complete the development. A complete list of green remedial activities considered as part of the NYC VCP is included in the Sustainability Statement, included as Appendix 2.

4.0 REMEDIAL ACTION

4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

The preferred remedial action alternative is Alternative 2, the Track 4 Alternative. The preferred remedial action alternative achieves protection of public health and the environment for the intended use of the property. The preferred remedial action alternative will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action alternative is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action alternative is cost effective and implementable and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.

2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.

3. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility. A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to start of remedial action.

4. Selection of NYSDEC 6NYCRR Part 375 Site Specific (Track 4) Soil Cleanup Objectives (SCOs).

5. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.

6. Excavation and removal of soil/fill exceeding Track 4 Site-Specific SCOs. For development purposes, excavation within the new building slab will extend approximately 2 feet below ground surface (bgs). An elevator shaft area will be

excavated to a depth of 5 feet. If soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation after removal of all soil required for construction of the buildings is complete, additional excavation will be performed to meet Track 4 Site-Specific SCOs. Approximately 600 tons of contaminated soil will be excavated and removed from this Site.

7. Excavation and removal of soils in hotspot area around soil boring SP-1 in parking lot area to meet Track 4 SCOs.
8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
9. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
10. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations.
11. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite.
12. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
13. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
14. Installation of a vapor barrier/waterproofing membrane system below the slab on-grade portion of the building, as well as behind subgrade portions of foundation walls of the proposed building.
15. Construction and maintenance of an engineered composite cover consisting of the concrete building slab to prevent human exposure to residual soil/fill remaining under the Site.

16. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.

17. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

18. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.

19. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.

The property will continue to be registered with an E-Designation by the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls in this RAWP and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

Track 4 Soil Cleanup Objectives (SCOs) are proposed for this project. The SCOs for this Site will be 6NYCRR Part 375, Table 6.8 (b) Restricted Residential Use SCOs as amended by the following Site-Specific (Track 4) SCOs:

Contaminant	**Track 4 SCOs**
Total SVOCs	250 ppm
Lead	1000 ppm
Arsenic	23 ppm
Barium	600 ppm
Mercury	2.5 ppm

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in **Appendix 3**. The location of planned excavations is shown in **Figure 5.**

No over-excavation beyond the cut is anticipated. Any hotspot areas are identified during development and remediation at the site will be removed.

Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill to be excavated and disposed off-Site is 600 tons.

Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

End-Point Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmation soil sampling. Five end-point samples will be collected from the base of the excavation and from hot spot area at locations to be determined by OER. For comparison to Track 1 SCOs, analytes will include VOCs, SVOC, pesticides, PCBs and metals according to analytical methods described below. For comparison to Track 4 SCOs, analytes will only include trigger compounds and elements established on the Track 4 SCO list.

Hot-spot removal actions, whether established under this RAWP or identified during the remedial program, will be performed in conjunction with post remedial end-point samples to ensure that hot-spots are fully removed. Analytes for end-point sampling will be those parameters that are driving the hot-spot removal action and will be approved by OER. Frequency for hot-spot end-point sample collection is as follows:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.

2. For excavations 20 to 300 feet in perimeter:

- For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
- For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.

3. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.

4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

Post-remediation end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

New York State ELAP certified labs will be used for all confirmation and end-point sample analyses. Labs performing confirmation and end-point sample analyses will be reported in the

RAR. The RAR will provide a tabular and map summary of all confirmation and end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be Confirmation samples will be analyzed for compounds and elements as described above utilizing the following methodology:

Soil analytical methods will include:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;
- Target Analyte List metals; and
- Pesticides/PCBs by EPA Method 8081/8082.

If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and "finger print analysis" and required regulatory reporting (i.e. spills hotline) will be performed.

Quality Assurance/Quality Control

Quality Assurance/Quality control sampling will consist of collecting blind field duplicates, field blanks, and matrix spike duplicates. Hydro Tech will perform a completeness check of the analytical data packages and review the QA/QC observations and deficiencies.

Collected samples will be appropriately packaged, placed in coolers, and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or "cold-paks" to maintain a temperative of 4oC.

Dedicated disposable sampling materials will be used for the collection of endpoint samples, eliminating the need to prepared field equipment (rinsate) blanks. However, if non-disposable equipment is used (stainless steel scoop, etc.), field rinsate blanks will be prepared at a rate of 1 for every eight samples collected. Decontamination of non-dedicated sampling equipment will consist of the follow:

- Gently tap or scrape to remove adhered soil,
- Rinse with tap water,
- Wash with Alconox detergent solution and scrub,
- Rinse with tap water, and
- Rinse with distilled or deionized water.

Prepare field blanks by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers. Trip blanks will be used whenever samples are transported to the laboratory for analysis of VOCs. Trip blanks will not be used for samples to be analyzed for metals, SVOCs, pesticides, and PCBs. One blind duplicate sample will be prepared and submitted for analysis for every 20 samples.

Import and Reuse of Soils

Import of soils onto the property and reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 3. The estimated quantity of soil to be imported into the Site for backfill and cover soil in the vicinity of the hotspot is 1 ton. The estimated quantity of onsite soil/fill expected to be reused/relocated on Site is 0 tons.

4.3 ENGINEERING CONTROLS

The excavation required for the proposed Site development will achieve Track 4 Site Specific SCOs. Engineering Controls are required to address residual contamination remaining at the site. Engineering controls consisting of a composite cover and a vapor barrier (minimum of 20 mil) will be employed in the remedial action to address residual contamination remaining at the Site.

Composite Cover System

Exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site. This composite cover system is comprised of a concrete slab in the cellar throughout the Site and in the at-grade garage area.

The composite cover system is a permanent engineering control for the Site. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the Site Management Plan in the RAR.

Vapor Barrier

Migration of soil vapor will be mitigated with a combination of building slab and vapor barrier.

A vapor barrier will be installed beneath the building slab and behind the foundation walls. The vapor barrier will be installed according to manufacturer instructions and all seams, penetrations and repairs will be sealed. Once the vapor barrier has been selected and the installation details have been finalized, the specifications will be provided to the OER.

The project's Professional Engineer licensed by the State of New York will have primary direct responsibility for overseeing the implementation of the vapor barrier. The Remedial Action Report will include photographs (maximum of two photos per page) of the installation process, PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturers certificate of warranty.

4.4 INSTITUTIONAL CONTROLS

Institutional Controls (IC) have been incorporated in this remedial action to manage residual soil/fill and other media and render the Site protective of public health and the environment. Institutional Controls are listed below. Long-term employment of EC/ICs will be implemented under a site-specific Site Management Plan (SMP) that will be included in the RAR.

Institutional Controls for this remedial action are:

- The property will continue to be registered with an E-Designation by the NYC Buildings Department. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the Site Management Plan which will note that the property owner and property owner's successors and assigns must comply with the approved SMP;
- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, monitoring, inspection, reporting and certification of ECs. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted at a frequency to be determine by OER in the SMP and will comply with RCNY §43-1407(l)(3).
- Vegetable gardens and farming on the Site are prohibited in contact with residual soil materials;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will be used for residential use and will not be used for a higher level of use without prior approval by OER.

4.5 SITE MANAGEMENT PLAN

Site Management is the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The Site Management

Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the Site Management Plan are implemented.

4.6 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

Investigations reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA). As part of the VCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was prepared in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Known and Potential Sources

Based on the results of the RIR, the contaminants of concern are:

Soil:

- SVOCs including Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene and Pyrene exceed their respective Restricted Residential SCOs.

- Metals including Arsenic, Barium, Chromium Hexavalent, Copper, Lead and Mercury exceed their Restricted Residential SCOs.

Groundwater:

- SVOCs including Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene and Benzo(k)fluoranthene exceed their respective GQS.

- Metals including Magnesium, Manganese and Sodium exceed their respective GQS.

Soil Vapor:

- Chlorinated- and petroleum-related VOCs were present in the soil vapor samples including 1,1,1-Trichloroethane and Tetrachloroethylene at levels below the monitoring range.

Nature, Extent, Fate and Transport of Contaminants

SVOCs and metals are present in the soil in the northeastern and northwestern portion of the Site. Metals are present in the soil throughout the site. Metals and SVOCs are elevated in western portion of site. Metals and SVOCs were also identified in the groundwater at the Site at concentrations exceeding the GQS. Metals identified in groundwater were not identified in soils. Low levels of chlorinated VOCs were identified in the soil vapor samples were not detected in soil or groundwater at the Site.

Potential Routes of Exposure

The five elements of an exposure pathway are: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population. An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be documented. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

- Ingestion of water, fill, or soil;

- Inhalation of vapors and particulates; and

- Dermal contact with water, fill, soil, or building materials.

Existence of Human Health Exposure

Current Conditions: There is potential for soil vapors to accumulate beneath the existing building slab at the Site. Groundwater is marginally contaminated but is not exposed at the Site, and because the Site is served by the public water supply and groundwater use for potable supply is prohibited, groundwater is not used at the Site and there is no potential for exposure. There is no potential for direct exposure and ingestion of water, soil and fill currently at the site due to the existing asphalt cover.

Construction/ Remediation Activities: Once redevelopment activities begin, construction workers will come into direct contact with surface and subsurface soils and groundwater, as a result of on-Site construction and excavation activities. On-Site construction workers potentially could ingest, inhale or have dermal contact with any exposed impacted soil, and fill. Similarly, off-Site receptors could be exposed to dust and vapors from on-Site activities. During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials Management Plan, dust controls, and through the implementation of the Community Air-Monitoring Program and a Construction Health and Safety Plan.

Proposed Future Conditions: Under future remediated conditions, most or all soils in excess of Track 1 SCOs will be removed and the site will meet, at minimum, Track 4 SCOs. The site will be fully capped, limiting potential direct exposure to soil and groundwater remaining in place, and engineering controls including a vapor barrier system and composite cover will prevent potential for inhalation via soil vapor intrusion. The site is served by a public water supply and groundwater is not used at the site. There are no plausible off-site pathways for ingestion, inhalation, or dermal exposure to contaminants derived from the site.

Receptor Populations

On-Site Receptors: Onsite receptors are limited to trespassers and site representatives and visitors granted access to the property. During construction, onsite receptors will include construction workers, site representatives and visitors. After construction, onsite receptors will include child and adult residents and occupants of the site, employees and commercial customers.

Off-Site Receptors: Potential off-site receptors within a 0.25-mile radius of the Site include: adult and child residents, and commercial and construction workers, pedestrians, trespassers, and cyclists, based on the following:

1. Commercial Businesses – existing and future
2. Residential Buildings – existing and future
3. Building Construction/Renovation – existing and future
4. Pedestrians, Trespassers, Cyclists– existing and future
5. Schools– existing and future

Overall Human Health Exposure Assessment

There are no complete exposure pathways for the current site condition. There is a potential complete exposure pathway that requires mitigation during implementation of the remedy. There is no complete exposure pathway under future conditions after the site is developed. This assessment takes into consideration the reasonably anticipated use of the site, which includes a commercial and residential structure, site-wide impervious surface cover cap, and a subsurface vapor barrier system for the building. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters in close proximity to the Site that could be impacted or threatened.

During remedial construction, on-Site and off-Site exposures to contaminated dust from historic fill material will be addressed through dust controls, and through the implementation of the Community Air Monitoring Program, the Soil/Materials Management Plan, and a Construction Health and Safety Plan. After the remedial action is complete, there will be no remaining exposure pathways to on-Site soil/fill, as all soil above Unrestricted Use SCOs will have been removed and a vapor barrier system will have been installed as part of development.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 PROJECT ORGANIZATION AND OVERSIGHT

Principal personnel who will participate in the remedial action include Holly Hawkins (Project Manager) and Rachel Ataman (Senior Vice President). The Professional Engineer (PE) for this project is Shaik Saad and the Qualified Environmental Professional (QEP) for this project is Mark E. Robbins.

5.2 SITE SECURITY

Site access will be controlled by barriers that will be installed around work areas as needed to delineate and restrict access to the work area. For work areas of limited size, barrier tape will be sufficient to delineate and restrict access. For larger worker areas, temporary fencing will be provided.

5.3 WORK HOURS

The hours for operation of remedial construction will be from 7:00am to 5:00pm. These hours conform to the New York City Department of Buildings construction code requirements.

5.4 CONSTRUCTION HEALTH AND SAFETY PLAN

The Health and Safety Plan is included in Appendix 4. The Site Safety Coordinator will be Holly Hawkins. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour

refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign an HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a logbook or specific form.

An emergency contact sheet with names and phone numbers is included in the HASP. That document will define the specific project contacts for use in case of emergency.

5.5 COMMUNITY AIR MONITORING PLAN

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedances of action levels observed during performance

of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for OER personnel to review.

5.6 AGENCY APPROVALS

All permits or government approvals required for remedial construction have been or will be obtained prior to the start of remedial construction. Approval of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

5.7 SITE PREPARATION

Pre-Construction Meeting

OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed incompliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Markout Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive, excavation or other remedial activity performed under the RAWP.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations.

Stabilized Construction Entrance

Steps will be taken to ensure that trucks departing the site will not track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete roads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC VCP Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

Extreme Storm Preparedness and Response Contingency Plan

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the enrollee will undertake the following steps for site preparedness prior to the event and response after the event.

Storm Preparedness

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; lose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and

generators will be removed from holes, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; storm water management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to OER at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYS DEC within 2 hours of identification and consistent with State regulations. Emergency and spill conditions will also be reported to OER. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed. Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will by collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Storm-water control systems and structures will be inspected and maintained as necessary. If soil or fill materials are discharged off site to adjacent properties, property owners and OER will be notified and corrective measure plan designed to remove and clean dislocated material will be submitted to OER and implemented following approval by OER and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the discretion of OER. If onsite petroleum spills are identified, a qualified environmental

professional will determine the nature and extent of the spill and report to NYS DEC's spill hotline at DEC 800-457-7362. If the source of the spill is ongoing and can be identified, it should be stopped it this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYS DEC.

Storm Response Reporting

A site inspection report will be submitted to OER at the completion of site inspection. An inspection report established by OER is available on OER's website (www.nyc.gov/oer) and will be used for this purpose. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. The site inspection report will be sent to the OER project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number. Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYS DEC; description of corrective actions; schedule for corrective actions. This report should be completed and submitted to OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.8 TRAFFIC CONTROL

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site will be provided to the OER once the soil disposal facilities have been determined.

5.9 DEMOBILIZATION

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (*e.g.*, soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

5.10 REPORTING AND RECORD KEEPING

Daily Reports

Daily reports providing a general summary of activities for each day of *active remedial work* will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any;
- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

Record Keeping and Photo-Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

5.11 COMPLAINT MANAGEMENT

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

5.12 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and

- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

6.0 REMEDIAL ACTION REPORT

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Site Management Plan (if Track 1 is not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action and DUSR;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Continue registration of the property with an E-Designation by the NYC Department of Buildings.
- Reports and supporting material will be submitted in digital form.

Remedial Action Report Certification

The following certification will appear in front of the Executive Summary of the Remedial Action Report. The certification will include the following statements:

I, Shaik Saad, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 387 Manhattan Avenue Site Site number.

I, Mark E. Robbins am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the 387 Manhattan Avenue Site Site number.

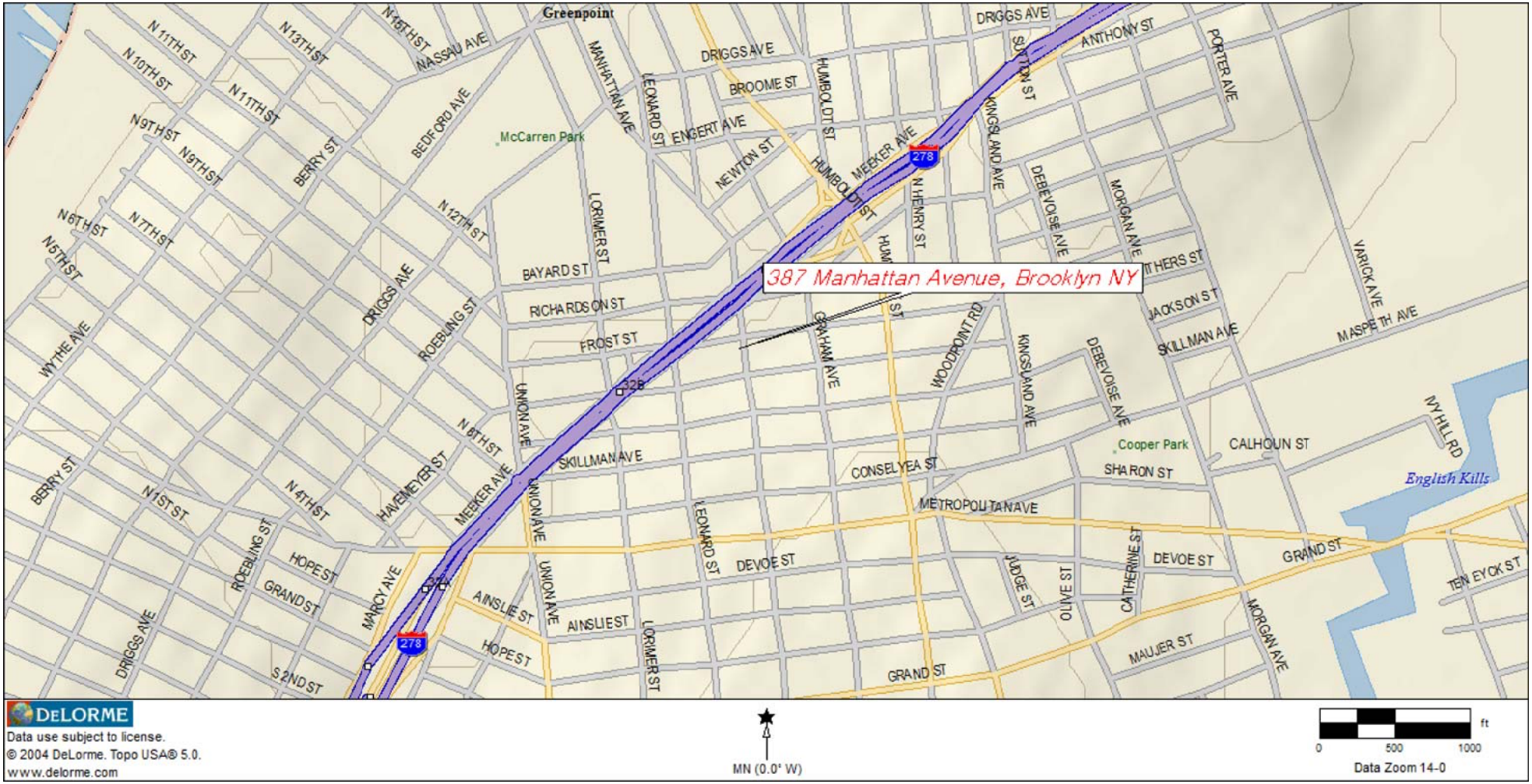
I certify that the OER-approved Remedial Action Work Plan dated month day year and Stipulations in a letter dated month day, year; if any were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a 24-month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	4
Fact Sheet 2 announcing start of remedy	0	4
Mobilization	1	1
Remedial Excavation	3	4
Demobilization	6	1
Submit Remedial Action Report	28	4

Figures



HYDRO TECH ENVIRONMENTAL CORP.

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www.hydrotechenvironmental.com

387 - 389 Manhattan Avenue
Brooklyn, NY.
HTE Job # 140334

Drawn By:	C.Q.
Reviewed By:	M.R
Approved By:	M.R
Date:	01/08/15
Scale:	AS NOTED

TITLE:

FIGURE 1: SITE LOCATION MAP

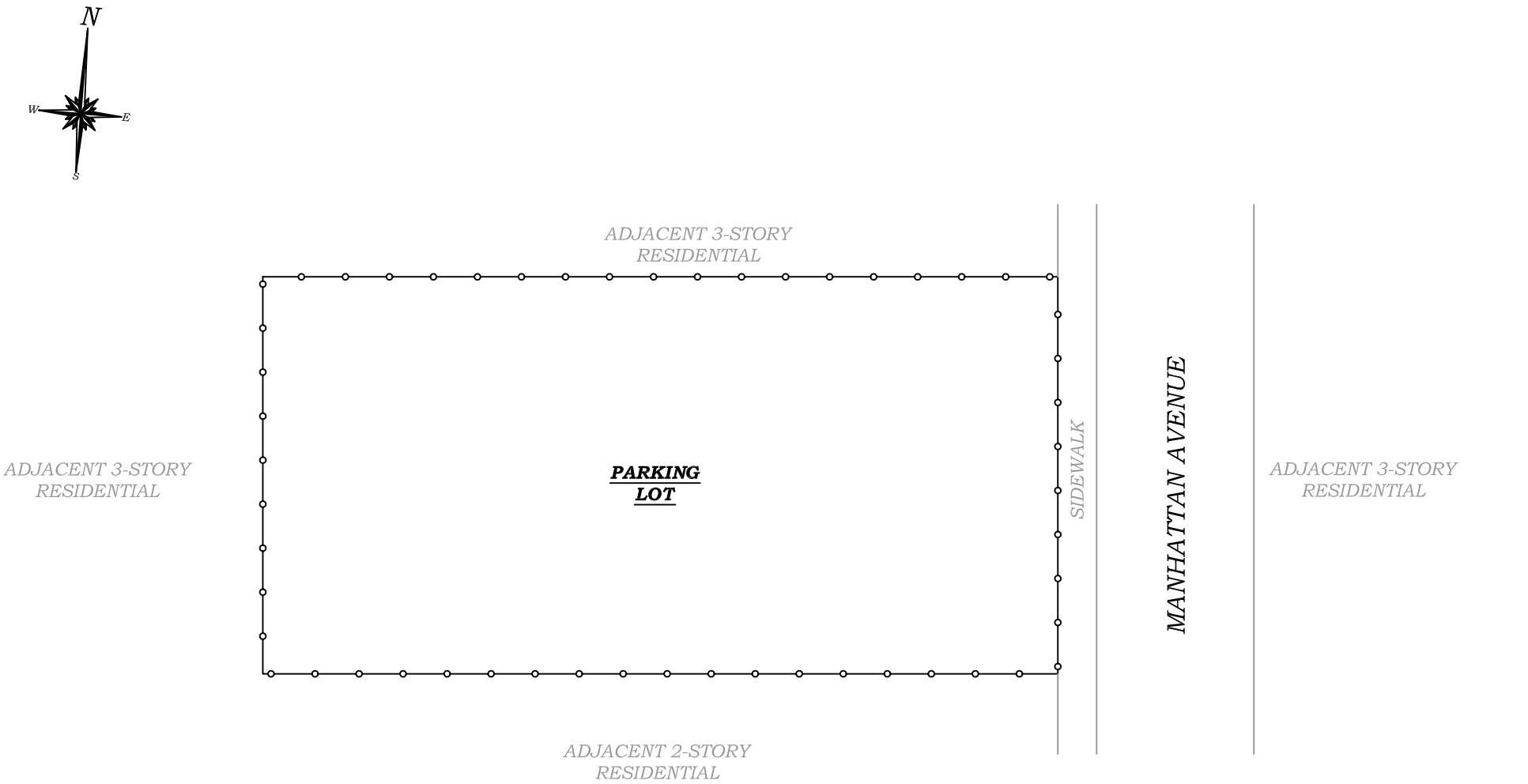

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FIGURE 2: SITE BOUNDARY MAP

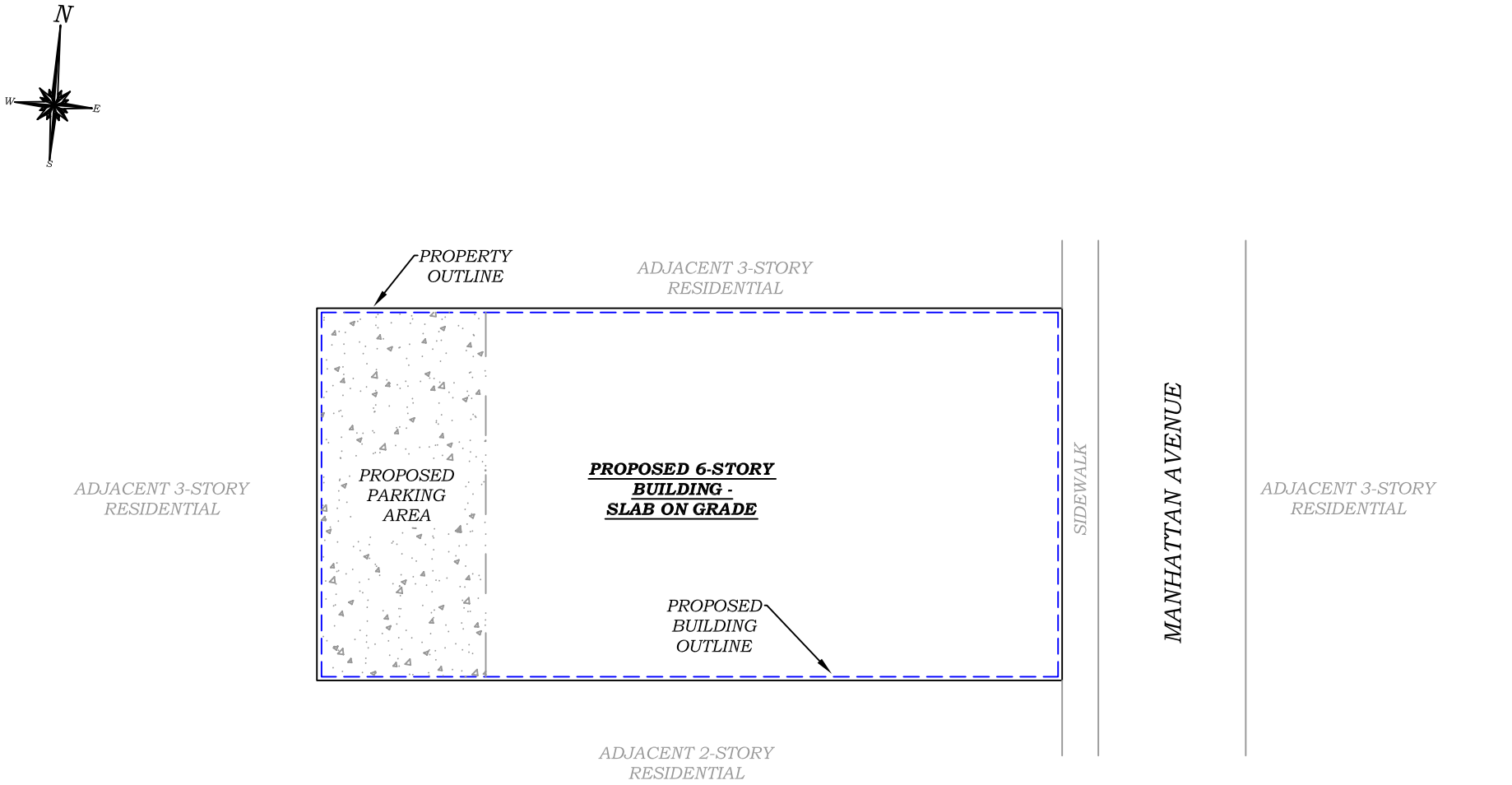

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FIGURE 3: PROPOSED REDEVELOPMENT PLAN

Land Use

All land use categories

2003 2005 2007 2009 2013

- 1 & 2 Family Residential
- Multi-family Residential
- Mixed Use
- Open space & outdoor recreation
- Commercial
- Institutions
- Industrial
- Parking
- Transportation / Utilities
- Vacant Lots

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FIGURE 4: LAND-USE MAP

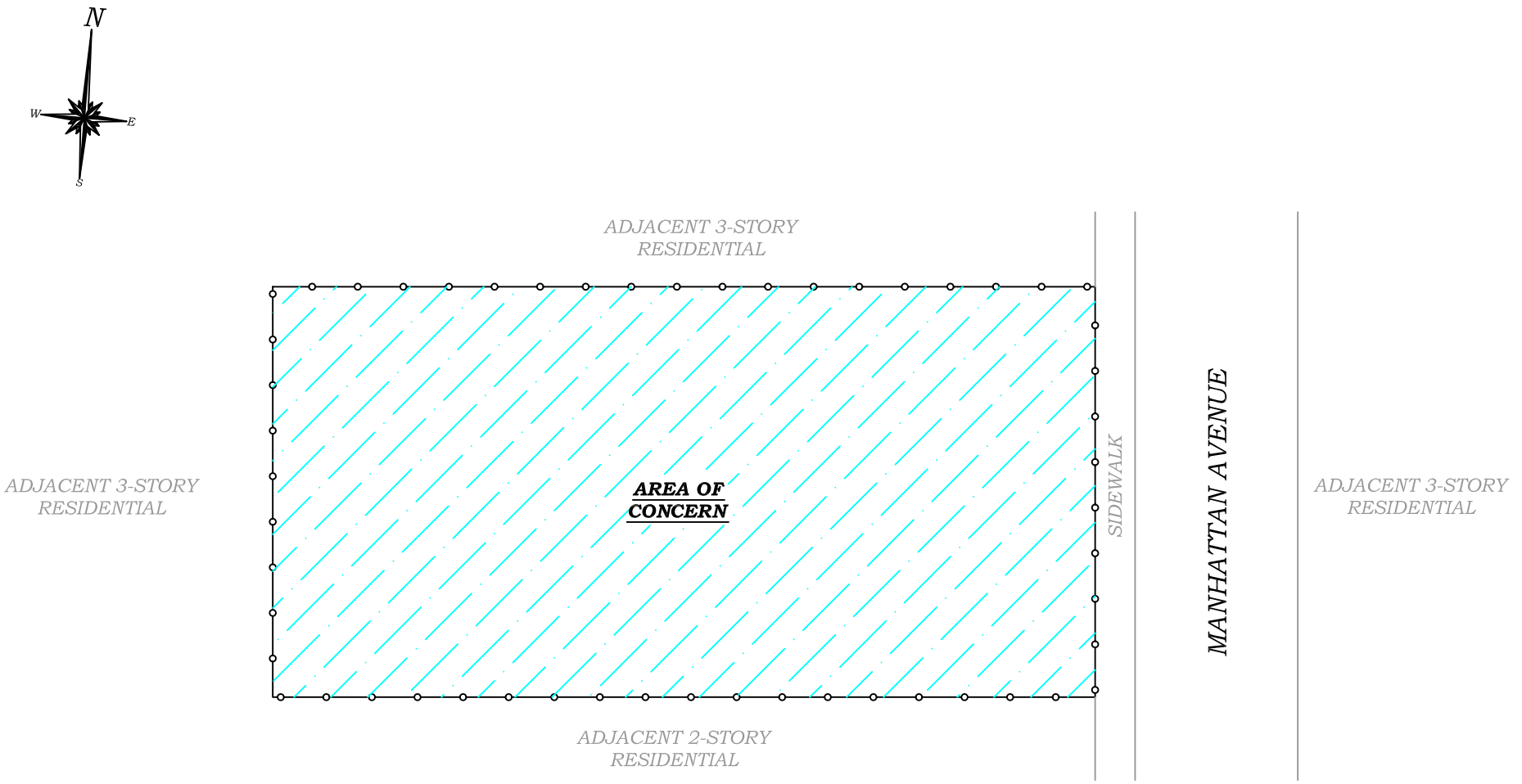

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FIGURE 5: LOCATIONS OF PLANNED EXCAVATION

APPENDIX 1
CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and AB Capstone have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, AB Capstone will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, Rebecca Bubb, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841

Project Contact List. OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project

manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at brownfields@cityhall.nyc.gov.

Repositories. A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. AB Capstone will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Brooklyn Public Library

81 Devoe Street, Brooklyn NY 11211

(718)-486-3365

Monday 10:00 am-6:00pm

Tuesday 1:00 pm-8:00 pm

Wednesday through Friday 10:00 am-6:00 pm

Saturday 10:00 am-5:00 pm, and closed on Sundays.

Digital Documentation. NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

Identify Issues of Public Concern. There are no known issues of public concern associated with this project.

Public Notice and Public Comment. Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be prepared by AB Capstone, reviewed and approved by OER prior to distribution and mailed by AB Capstone.

Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

Citizen Participation Milestones. Public notice and public comment activities occur at several steps during a typical NYC VCP project. See flow chart on the following page, which identifies when during the NYC VCP public notices are issued: These steps include:

- **Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan.**

  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.

- **Public Notice announcing the approval of the RAWP and the start of remediation**

  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.

- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

APPENDIX 2

SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

Reuse of Clean, Recyclable Materials. Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the RAR.

Reduce Consumption of Virgin and Non-Renewable Resources. Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

An estimate of the quantity (in tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

Reduced Energy Consumption and Promotion of Greater Energy Efficiency. Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the Remedial Action Report (RAR). Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

Conversion to Clean Fuels. Use of clean fuel improves NYC's air quality by reducing harmful emissions.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

Recontamination Control. Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

Storm-water Retention. Storm-water retention improves water quality by lowering the rate of combined storm-water and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced storm-water retention capability of the redevelopment project will be included in the RAR.

Linkage with Green Building. Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this brownfield redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this brownfield redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

Paperless Brownfield Cleanup Program. AB Capstone is participating in OER's Paperless Brownfield Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

Low-Energy Project Management Program. AB Capstone is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

Trees and Plantings. Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.

APPENDIX 3

SOIL/MATERIALS MANAGEMENT PLAN

1.1 SOIL SCREENING METHODS

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the RAR. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

1.2 STOCKPILE METHODS

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 CHARACTERIZATION OF EXCAVATED MATERIALS

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 MATERIALS EXCAVATION, LOAD-OUT AND DEPARTURE

The PE/QEP overseeing the remedial action will:

- Oversee remedial work and the excavation and load-out of excavated material;
- Ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- Ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- Ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- Ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- Ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

1.5 OFF-SITE MATERIALS TRANSPORT

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes will be provided once the soil disposal facility has been determined. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 MATERIALS DISPOSAL OFF-SITE

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in Brooklyn, New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the RAR.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization

sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

1.7 MATERIALS REUSE ON-SITE

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

1.8 DEMARCATION

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover will be considered impacted and subject to site management after the remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

This demarcation will constitute the top of the site management horizon. Materials within this horizon require adherence to special conditions during future invasive activities as defined in the Site Management Plan.

1.9 IMPORT OF BACKFILL SOIL FROM OFF-SITE SOURCES

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site.

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

Source Screening and Testing

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
- The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.10 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the

groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

1.11 STORM-WATER POLLUTION PREVENTION

Applicable laws and regulations pertaining to storm-water pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAWP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 CONTINGENCY PLAN

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER.

Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 ODOR, DUST AND NUISANCE CONTROL

Odor Control

All necessary means will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and

corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

Other Nuisances

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

APPENDIX 4

HEALTH AND SAFETY PLAN

CONSTRUCTION HEALTH & SAFETY PLAN

387 Manhattan Avenue
Block 2738, Lot 21
Brooklyn, New York

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Attachments

1.0 INTRODUCTION

This Construction Health & Safety Plan (CHASP) has been prepared by Hydro Tech Environmental, Corp. (Hydro Tech) as a part of the Remedial Action Work Plan (RAWP) for 387 Manhattan Avenue (Block 2738 and Lot 21) and situated in East Williamsburg section of the Brooklyn, New York.

This CHASP will conform to applicable regulations, safe work practices and the project's requirements, and addresses those activities associated with the development of a 1,750 square foot parking lot located in the western portion of the Site and a 3,000 square foot six-story mixed use commercial and residential building with no basement.

The Hydro Tech Project Manager (PM), Site Safety Officer (SSO) and field staff (when necessary) will implement the Plan during construction. Compliance with this HASP is required of all persons and third parties who perform the scope of work documented for this project. Assistance in implementing this CHASP can be obtained from the SSO. The content of this CHASP may change or undergo revisions based upon additional information that is made available to health and safety personnel, monitoring results, or changes in the technical scope of work.

It should be noted that this CHASP does not apply to any other scopes of work that may be performed at the Site that are not specifically outlined in this report. Through preparation of this HASP, Hydro Tech and all Subcontractors (if any) do not guarantee the health or safety of any person entering this Site. Due to the nature of this Site and the activities occurring thereon, it is not possible to discover, evaluate and provide protection for all possible hazards that may be encountered. Only those portions of this CHASP that specifically apply to authorized personnel of Hydro Tech will enact the activities at the Site. Strict adherence to the applicable portions of these health and safety guidelines set forth herein will reduce, but not eliminate the potential for injury at this Site. The health and safety guidelines in this CHASP were prepared specifically for this Site and should not be utilized for any other site without prior research and evaluation by trained health and safety specialists and approval by Hydro Tech.

2.0 SCOPE OF WORK

This Construction HASP has been prepared as a part of the RAWP to be implemented during the upcoming development of the Site. Prior environmental assessments identified Semi Volatile Organic Compounds (SVOCs) including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene & pyrene and Metals including arsenic, barium, chromium trivalent, copper, lead, mercury, nickel, selenium and zinc in soil/fill beneath the Site at concentrations exceeding their respective Unrestricted Use Soil Cleanup Objectives (SCOs). A range of vapors associated with chlorinated solvents and petroleum constituents were also detected beneath the Site.

The portions of the construction activities specifically addressed in this Construction HASP will include the following and will be performed in the following sequence:

- Supervision of the excavation of soil/fill and other material
- Supervision of the installation of concrete foundations
- Supervision of the installation of vapor barrier.

Prior to any fieldwork, the New York City One-Call Unit will be contacted so that all public utilities can be marked out. The proposed schedule of fieldwork will be coordinated with the developer and the OER.

3.0 STAFFING

This section briefly describes the personnel involved in Site remedial activities, their contact information and their health and safety responsibilities. This section also provides directions to hospital in the case of a health emergency.

EMERGENCY NUMBERS

Contact	Phone Number
Woodhull Hospital	(718) 963-8588
New York City EMS	911
NYPD	911
NYFD	911
National Response Center	(800) 424-8802
Poison Information Center	(800) 562-8816
Chemtree	(800) 424-9555

Project Management/Health and Safety Personnel

Title	Contact	Phone Number	Cell Phone
Senior Geologist	Rachel Ataman	(631) 462-5866	(631) 457-0032
Site Safety Officer	Holly Hawkins	(718) 636-0800	(631) 457-0033
Project Manager	Holly Hawkins	(718) 636-0800	(631) 457-0033

Directions to Woodhull Hospital (See Attached Figure 1)

Head south on Manhattan Ave toward Withers Street. Stay on Manhattan Avenue until you can merge left onto Broadway. Merge left onto Broadway. Stay on Broadway until you reach Flushing Avenue. Woodhull Hospital will be on the right at 760 Broadway, Brooklyn, NY.

PROJECT MANAGER

As necessary, the Project Manager will perform the following:

- Has the overall responsibility for the health and safety of site personnel
- Ensures that adequate resources are provided to the field staff to carry out their responsibilities as outlined below.
- Ensures that fieldwork is scheduled with adequate personnel and equipment resources to complete the job in a safe manner.
- Ensures that adequate communication between field crews and emergency response personnel is maintained.
- Ensures that field site personnel are adequately trained and qualified to work at the Site.

SITE SAFETY OFFICER

As necessary, the Site Safety Officer will perform the following:

- Directs and coordinates health and safety monitoring activities.
- Ensures that field teams utilize proper personal protective equipment (PPE).
- Conducts initial on-Site, specific training prior to personnel and/or subcontractors proceeding to work.
- Conducts and documents periodic safety briefings; ensures that field team members comply with this Construction HASP.
- Completes and maintains Accident/Incident Report Forms.
- Notifies corporate administration of all accidents/incidents.
- Determines upgrade or downgrade of PPE based on site conditions and/or downgrade of PPE based on site conditions and/or real-time monitoring results.
- Ensures that monitoring instruments are calibrated daily or as determined by manufacturer's suggested instructions.
- Maintains health and safety field log books.
- Develops and ensures implementation of the Construction HASP.
- Approves revised or new safety protocols for field operations.
- Coordinates revisions of this Construction HASP with field personnel and the SSO Division Contracting Officer.
- Responsible for the development of new company safety protocols and procedures and resolution of any outstanding safety issues which may arise during the conduction of site work.
- Reviews personnel and subcontractors current and up-to-date medical examination and acceptability of health and safety training.

FIELD PERSONNEL AND SUBCONTRACTORS (IF ANY)

- Reports any unsafe or potentially hazardous conditions to the SSO
- Maintains knowledge of the information, instructions, and emergency response actions contained in this Construction HASP.
- Comply with rules, regulations and procedures as set forth in this Construction HASP and any revisions that are instituted.
- Prevents admittance to work sites by unauthorized personnel.

4.0 CHEMICAL & WASTE DESCRIPTION/CHARACTERIZATION

The following list of compounds is based on the results of the recent subsurface investigation:

Semi-Volatile Organic Compounds in soil:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene
- Pyrene

Heavy Metals in soil:

- Arsenic
- Barium
- Chromium trivalent
- Copper
- Lad
- Mercury
- Nickel
- Selenium
- Zinc

Semi-Volatile Organic Compounds in groundwater:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene

Heavy Metals in groundwater

- Magnesium
- Manganese
- Sodium

Volatile Organic Compounds in soil vapor:

- BTEX and associated petroleum related compounds
- Acetone
- Chloroform
- Methylene chloride
- Tetrachloroethylene
- 1,1,1-Trichloroethane
- Tetrahydrofuran

Appendix A contains Material Safety Data Sheets

The following information references are presented in order to identify the properties, characteristics and hazards of the compounds and metals that may/will be encountered at the Site.

* Dangerous Properties of Industrial Materials - Sax
* Chemical Hazards of the Workplace - Proctor/Hughes
* Condensed Chemical Dictionary - Hawley
* Rapid Guide to Hazardous Chemical in the Workplace - Lewis 1990.
* NIOSH Guide to Chemical Hazards – 1990.
* ACGIH TLV Values and Biological Exposure Indices - 1991-1992.

5.0 HAZARD ASSESSMENT AND MITIGATION

The potential hazards associated with planned site activities include chemical, physical and biological hazards associated with the construction. This section discusses those hazards that are anticipated to be encountered during the activities listed in the scope of work.

The potential to encounter chemical hazards is dependent upon the work activity performed (invasive or non-invasive), the duration, and location of the work activity. Such hazards could include inhalation or skin contact with chemicals that could cause: dermatitis, skin burn, being overcome by vapors, or asphyxiation. In addition, the handling of contaminated materials and chemicals could result in fire and/or explosion.

The potential to encounter physical hazards during site work includes: heat stress, exposure to excessive noise, loss of limbs, being crushed, head injuries, cuts and bruises, and other physical hazards due to motor vehicle operation, heavy equipment and power tools.

CHEMICAL HAZARDS
The potential for personnel and subcontractors to come in contact with chemical hazards may occur during the following tasks:

- Excavation
- Installation of vapor barrier
- Pouring of concrete foundation(s)

Exposure Pathways
Exposure to these compounds during ongoing activities may occur through inhalation of contaminated dust particles, inhalation of volatile vapor fume compounds, by way of dermal absorption, and accidental ingestion of the contaminant by either direct or indirect cross contamination activities (eating, smoking, poor hygiene). Indirectly, inhalation of contaminated dust particles can occur during adverse weather conditions (high or changing wind directions) or during operations that may generate airborne dust such as excavation.

Dust Suppression
The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities.

1. Applying water on haul roads.
2. Wetting equipment and excavation faces.
3. Spraying water on buckets during excavation and dumping.
4. Hauling materials in properly sealed or watertight containers.
5. Restricting vehicle speeds to 10mph.
6. Covering excavated areas and material after excavation activity ceases.
7. Reducing the excavation size and/or number of excavations.
8. Applying a dust suppressant, such as calcium chloride, in high vehicle traffic areas.

To evaluate the effectiveness if the dust suppression measures, air monitoring will be performed utilizing real-time dust-monitoring equipment. The requirements for air monitoring during post-remediation soil disturbance activities are presented in Section 5.0.

Additional Precautions
Dermal absorption or skin contact with chemical compounds is possible during invasive activities at the Site, including the excavation and/or capping of soils. The use of PPE in accordance with Section 9.0 and strict adherence to proper decontamination procedures should significantly reduce the risk of skin contact.

The potential for accidental ingestion of potentially hazardous chemicals is expected to be remote, when good hygiene practices are used. Unauthorized personnel, including all children, will not be allowed access to the Site.

PHYSICAL HAZARDS
A variety of physical hazards may be present during Site activities. These hazards are similar to those associated with any construction type project and include digging or boring operations and excavation activities in the vicinity of underground utility locations. These physical hazards are due to motor vehicles, and heavy equipment operation, the use of improper use of power and hand tools, misuse of pressurized cylinders, walking on objects, tripping over objects, working on surfaces which have the potential to promote falling, mishandling and improper storage of solid and hazardous materials, skin burns, crushing of fingers, toes, limbs, hit on the head by falling objects or hit one's head due to not seeing the object of concern, temporary loss of one's hearing and/or eyesight. Theses hazards are not unique and are generally familiarly to most hazardous waste site workers at construction sites. Additional task specific safety requirements will be covered during safety briefings.

6.0 SPILL PREVENTION AND CONTROL PLAN

Accidental spill and leaks of hazardous and non-hazardous materials will be properly controlled so that they do not adversely impact storm drain systems or receiving waters. A spill prevention and control plan will include the following:

Spill/Leak Prevention Measures;
-Place any material under cover (tarp) and away from storm drains or sensitive water bodies
-Properly label all containers so that the contents are easily identifiable
-Berm storage areas so that if a spill or leak occur they are easily contained

Spill Response Procedures
- Assessment of the Site and potential impacts by the SSO
- Containment of the material
- Notification of the personnel present at the Site and ensure evacuation procedure if necessary.

Spill Cleanup Procedures
-If small non-hazardous spill, use cleanup materials such as absorbents or rags and damp cloths and dispose of properly;
-If large non-hazardous spill or hazardous spill, a private hazmat team may need to be contacted to assess the situation and conduct the cleanup and proper disposal of the material.

Reporting
-Petroleum spills will be reported immediately to the NYSDEC Spill Hotline.
-If material is unknown or hazardous, contact the local Fire Department.

Training

-The SSO is responsible for providing refreshment training to all employees working on-site about spill prevention, spill response and cleanup on a routine basis.
-The SSO will identify key spill response personnel to assist in the spill control and cleanup procedures.

7.0 TRAINING

GENERAL HEALTH AND SAFETY TRAINING

In accordance with 29 CFR 1910.120, all construction personnel involved with the portions of the scope of work described in Section 2.0 will be briefed by the Project Manager on the potential hazards and the overall requirements in meeting the specifications of this Construction HASP.

The SSO will have the responsibility of ensuring that personnel assigned to this project comply with these requirements. Written certification of completion of any required training, if necessary, will be provided to the SSO.

MANAGER/SUPERVISOR TRAINING

In accordance with 29 CFR 1910.120, on-Site management and supervisors who will be directly responsible for, or who supervise employees engaged in hazardous waste operation shall receive training as required in this Construction HASP and at least eight (8) additional hours of specialized training on managing such operations at the time of job assignment.

ANNUAL 8-HOUR REFRESHER TRAINING

Annual 8-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualification for fieldwork. The following topics will be reviewed: toxicology, respiratory protection, including air purifying devices and self-contained breathing apparatus (SCBA), medical surveillance, decontamination procedures and personnel protective clothing. In addition, topics deemed necessary by the SSO may be added to the above list.

SITE SPECIFIC TRAINING

Prior to commencement of field activities, all personnel assigned to the project will be provided training that will specifically address the activities, procedures, monitoring, and equipment for the site operations. It will include Site and facility layout, hazards, and emergency services at the Site, and will highlight all provisions contained within this Construction HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

ON-SITE SAFETY BRIEFINGS

Project personnel and visitors will be given periodic on-site health and safety briefings by the SSO, or their designee, to assist site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices, or changes in the Site's environmental conditions. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety audits.

ADDITIONAL TRAINING

Additional training may be required by the SSO for participation in certain field tasks during the course of the project. Such additional training could be in the safe operation of heavy or power tool equipment or hazard communication training.

HAZWOPER TRAINING
All remedial personnel that will be in direct contact with the native soil/fill materials must complete an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and, where necessary, a current 8-hour refresher course

SUBCONTRACTOR TRAINING
Subcontractor personnel working on-site may be exempted from the contents of this Construction HASP. The SSO will determine if this exemption is allowed. In any case, the subcontractor personnel who are exposed to hazards are not exempted from the contents of this Construction HASP.

8.0 MEDICAL SURVEILLANCE

GENERAL
No general or specific medical surveillance or other medical requirements are set forth in this Construction HASP.

9.0 SITE CONTROL, PPE & COMMUNICATIONS

SITE CONTROL
The area where the activities of the scope of work will be performed is considered to be the Exclusion Zone (EZ). All areas where excavation and handling of contaminated materials take place are considered the EZ. This zone will be clearly delineated by cones, tape, or other means. The SSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Personnel are not allowed in the EZ without:

- A buddy
- Appropriate personal protective equipment (as necessary)

The remaining portions of the Site outside of the EZ will consist of a Support Zone (SZ) and a Contamination Reduction Zone (CRZ). Appropriate sanitary facilities, safety equipment, packaged/decontaminated and labeled samples will be located in SZ. Potentially contaminated personnel or materials will be allowed in the CRZ for decontamination as necessary.

PERSONAL PROTECTIVE EQUIPMENT
General
The level of protection worn by field personnel will be enforced by the SSO. Levels of protection may be upgraded or downgraded at the discretion of the SSO. The decision shall be based on real-time air monitoring, site history data, and prior site experience. Any changes in the level of protection shall be recorded in the health and safety field logbook.

PPE Specifications
For tasks requiring Level C PPE, the following equipment shall be used:
- Cotton or disposable coveralls
- Disposable outer coveralls (Poly-coated Tyvek)
- Gloves, inner (latex)
- Gloves, outer (Nitrile®)
- Boots (PVC), steel toe/shank

- Boot covers (as needed)
- Hard Hat
- Hearing protection (as needed)
- Splash suit and face shield for decontamination operations (as needed)

For tasks requiring Level D PPE, the following equipment shall be used:
- Cotton or disposable coveralls
- Gloves, inner (latex)
- Gloves, outer (Nitrile®)
- Boots (PVC) steel toe/shank
- Boot covers (as needed)
- Hard hat
- Hearing protection (as needed)
- Safety glasses

For tasks requiring Level D PPE, the following equipment shall be used:

- Cotton or disposable coveralls
- Gloves, inner (latex)
- Gloves, outer (Nitrile®)
- Boots (PVC) steel toe/shank
- Boot covers (as needed)
- Hard hat
- Hearing protection (as needed)
- Safety glasses

For tasks requiring respiratory protection, the following equipment shall be used:

Level D - No respiratory protective equipment necessary except for a dust mask
Level C - A full-face air-purifying respirator equipped with organic vapor/pesticide-HEPA cartridges
Level B - An air line respirator or a self-contained breathing apparatus (SCBA)

LEVEL OF PERSONAL PROTECTIVE EQUIPMENT REQUIRED

Activity	**Level of Protection Respiratory/PPE**
Excavations	C/D
Foundation Construction	C/D

COMMUNICATIONS
Communications is the ability to talk with others. While working in Level C Protection, personnel may find that communication become a more difficult task and process to accomplish. This is further complicated by distance and space. In order to address this problem, electronic instruments, mechanical devices or hand signals will be used as follows:

- Walkie-Talkies - Hand held radios would be utilized as much as possible by field teams for communication between downrange operations and the Command Post base station.

- Telephones - A mobile telephone will be located in the Command Post vehicle in the Support Zone for communication with emergency support services/facilities. If a telephone is demobilized, the nearest public phones will be identified.
- Air Horns - A member of the downrange field team will carry an air horn and another will be evident in the Support Zone to alert field personnel to an emergency situation.

- Hand Signals - Members of the field team using the buddy system will employ this communication method. Signals become especially important when in the vicinity of heavy moving equipment and when using Level B respiratory equipment. The signals shall become familiar to the entire field team before site operations commence and they will be reinforced and reviewed during site-specific training.

HAND SIGNALS FOR ON-SITE COMMUNICATION

Signal	**Meaning**
Hand gripping throat	Out of air, can't breathe
Grip partners' wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up	OK, I'm all right; I understand
Thumbs down	No; negative, unable to understand you. I'm not all right

10.0 AIR MONITORING PLAN

GENERAL

Continuous air monitoring in the EZ during invasive tasks will accompany site operations, as indicated in this HASP or as required by the SSO. Monitoring will be performed to verify the adequacy of respiratory protection, to aid in site layout and to document work exposure. All monitoring instruments shall be operated by qualified personnel only and will be calibrated daily prior to use, or more often as necessary. For additional references and information, see Hydro Tech's Site-Specific Air Monitoring Program.

REAL-TIME MONITORING

Instrumentation

A PID (to monitor total volatile organic concentrations) will be used to measure worker breathing zone ambient on-site concentrations during on-site activities. The equipment will be calibrated daily and the results noted in the project field book. A background level will be established, at a minimum, on a daily basis, and recorded in the field book.

The following response actions will be taken based on PID readings in the breathing zone. All work will be performed in level D PPE unless breathing zone volatile organic concentrations exceed 5 ppm. Once levels of 25 ppm are measured, work will be stopped.

Volatile Organics	Photoionization Detector (PID)	>5ppm	Temporarily halt work activities & monitor until readings decrease to below 5ppm.
		>5ppm<25ppm	Halt work activities, upgrade to level C continue monitoring.
		>25ppm	Shut down work activities

During soil excavation, particulate monitoring will be performed using a real-time particulate monitor that will monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

Object to be measured: Dust. Mists, Aerosols
Size range: < 0.1 to 10 microns
Sensitivity: 0.001 mg/m3
Overall Accuracy: = 10% as compared to gravimetric analysis of stearic acid or reference dust.

Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. The action level will be established at 150 ug/m3 over the integrated period not to exceed 15 minutes.

Action Levels
Action levels for upgrading of PPE in this Construction HASP will apply to all site work during the duration of field activities at the Site. The action level is the presence of visible airborne dust. When airborne dust is observed, specific dust-mitigating procedures will be implemented. These dust-mitigating procedures are documented in Section 6.0.

11.0 SAFETY CONSIDERATIONS

GENERAL
In addition to the specific requirements of this HASP, common sense should be used at all times. The general safety rules and practices below will be in effect at the Site at the discretion of the Project Manager, SSO or other authorized personnel.

- The site will be suitably marked or barricaded as necessary to prevent unauthorized visitors but not hinder emergency services if needed.

- As needed, all open holes, trenches, and obstacles will be properly barricaded in accordance with local site requirements. These requirements will be determined by proximity to traffic ways, both pedestrian and vehicular, and site of the hole, trench, or obstacle. If holes are required to be left open during non-working hours, they will be adequately decked over or barricaded and sufficiently lighted.

- Before any digging or boring operations are conducted, underground utility locations will be identified. All boring, excavation, and other site work will be planned and performed with consideration for underground lines. Any excavation work will be performed in accordance with Hydro Tech's Standard Operating Procedures for Excavations.

- Either workers or other people will enact dust-mitigating procedures when the potential for the inhalation of dust particles is present.

- The act of smoking and/or ignition sources in the vicinity of potentially flammable or contaminated material is strictly prohibited.

- Drilling, boring, and use of cranes and drilling rigs, erection of towers, movement of vehicles and equipment and other activities will be planned and performed with consideration for the location, height, and relative position of aboveground utilities and fixtures, including signs; canopies; building and other structures and construction; and natural features such as trees,

boulders, bodies of water, and terrain.

- When working in areas where flammable vapors may be present, particular care shall be exercised with tools and equipment that may be sources of ignition. All tools and equipment provided must be properly bonded and/or grounded. Metal buttons and zippers are prohibited on safety clothing for areas that may contain a flammable or explosive atmosphere.

- Approved and appropriate safety equipment (as specified in this Construction HASP), such as eye protection, hard hats, foot protection, and respirators, must be worn in areas where required. In addition, eye protection must be worn when sampling soil or water that may be contaminated.

- No smoking, eating, chewing tobacco, gum chewing, or drinking will be allowed in the contaminated areas.

- Contaminated tools and hands must be kept away from the face.

- Personnel must use personal hygiene safe guards (washing up) at the end of the shift or as soon as possible after leaving the Site.

- Each sample must be treated and handled as though it were contaminated.

- Persons with long hair and/or loose fitting clothing that could become entangled in power equipment must take adequate precautions.

- Horseplay is prohibited in the work area.

- Work while under the influence of intoxicants, narcotics, or controlled substances is prohibited.

POSTED SIGNS

Posted danger signs will be used where an immediate hazard exists. Caution signs will be posted to warn against potential hazards and to caution against unsafe practices. Traffic control methods and barricades will be used as needed. Wooden stakes and flagging tape, or equally effective material will be used to demarcate all restricted areas.

Other postings may include the OSHA poster, emergency hospital route, and telephone numbers of contact personnel.

INVASIVE OPERATIONS

The SSO will be present on-Site during all invasive work (e.g. excavations and capping). The SSO will ensure that appropriate monitoring, levels of protection, and safety procedures are followed. No personnel will enter any excavations for any reasons. All non-essential personnel will stay at least 10 feet back from the edge of the excavation and out of the swing radius of the backhoe. No drums or other potential sources will be sampled or removed during this phase without further additions to the Construction HASP.

The proximity of water, sewer, and electrical lines will be identified prior to invasive operations. The possibility of the presence of underground conduits or vessels containing materials under

pressure will also be investigated prior to invasive operations. Properly-sized containment systems will be utilized and consideration of the potential volume of liquid or waste released during operations will be discussed with members of the field team to minimize the potential for spills and provide a method for collection of waste materials. Emergency evacuation procedures and the location of safety equipment will be established prior to start up operations. The use of protective clothing, especially hard hats, boots, and gloves will be required during drilling and other heavy equipment work.

SOIL, GROUNDWATER AND LIQUID WASTE SAMPLING
During Site invasive excavation, soil sampling for waste characterization may be required for disposal purposes. No groundwater or liquid waste sampling is anticipated during site remediation.

HEAVY EQUIPMENT DECONTAMINATION
Personnel steam cleaning heavy equipment, if necessary shall use the prescribed level of protection and adhere to the buddy system. Initially this task usually employs Level C. The heavy equipment decontamination shall be restricted to authorized personnel only. Special consideration will be given to wind speed and direction. Downwind areas are to be kept free of personnel to avoid unnecessary exposure to potential airborne contamination.

ADDITIONAL SAFETY CONSIDERATIONS
No other additional safety considerations at this time.

12.0 DECONTAMINATION AND DISPOSAL PROCEDURES

CONTAMINATION PREVENTION
One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention should minimize worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

<u>Personnel:</u>
Do not walk through areas of obvious or known contamination.
Do not directly handle or touch contaminated materials.
Make sure that there are no cuts or tears on PPE.
Fasten all closures in suits; cover with tape if necessary.
Particular care should be taken to prevent any skin injuries.
Stay upwind of airborne contaminants.
Do not carry cigarettes, cosmetics, gum, etc. into contaminated areas.

<u>Sampling and Monitoring:</u>
When required by the SSO, cover instruments with clear plastic, leaving openings for sampling ports. Keep all decontaminated sampling materials in bags prior to emplacement of sample matrix.

<u>Heavy Equipment:</u>
Care should be taken to limit the amount of contamination that comes in contact with heavy equipment (tires). Dust control measures may be needed on roads inside the site boundaries.

PERSONNEL DECONTAMINATION
All personnel shall pass through an outlined decontamination procedure when exiting the hot

zone at each location. A field wash for equipment and PPE shall be set up at each work location. The system will include a gross wash and rinse for all disposable clothing and boots worn in the EZ. Upon exiting the EZ, all personnel will wash their hands, arms, neck, and face before entering the Support Zone.

EQUIPMENT DECONTAMINATION

Equipment used at the Site that is potentially contaminated shall be decontaminated to prevent hazardous materials from leaving the Site. All heavy equipment will be decontaminated at the decontamination pad and inspected by the SSO and Project Manager before it leaves the Site. The decontamination area will provide for the containment of all wastewater from the decontamination process. Respirators, airline and any other personnel equipment that comes in contact with contaminated soils shall pass through a field wash.

DECONTAMINATION DURING MEDICAL EMERGENCIES

If emergency life-saving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or omitted. The Site SSO or designee will accompany contaminated victims to the medical facility to provide advice on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances and /or medical personnel. Outer garments are then removed at the medical facility.

No attempt will be made to wash or rinse the victim, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material that could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed. Note that heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Less serious forms of heat stress also require prompt attention and removal of protective clothing immediately. Decontamination should be omitted or minimized and treatment begun immediately unless the victim is obviously contaminated.

DISPOSAL PROCEDURES

The SSO and Project Manager will develop a segregating system of non-hazardous waste and hazardous waste. All discarded material, waste materials, or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating sanitary hazards, or causing litter to be left on site. All potentially contaminated materials, e.g. clothing, gloves, etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials shall be collected and bagged for appropriate disposal as normal domestic waste.

13.0 EMERGENCY PLAN

The potential for the development of an emergency situation is low considering the low concentrations of hazardous substances at the work site. Nevertheless, an emergency situation could occur. All personnel, prior to the start of work, will know the emergency plan outlined in this section. The emergency plan will be available for use at all times during site work.

Various individual site characteristics will determine preliminary actions taken to assure that this

emergency plan is successfully implemented in the event of a site emergency. Careful consideration must be given to the proximity of neighborhood housing or places of employment, and to the relative possibility of site fire, explosion or release of vapors or gases that could affect the surrounding community.

The Project Manager shall make contact with local fire, police, and other emergency units prior to beginning work on site. In these contacts, the Project Manager will inform the emergency units about the nature and duration of work expected to the Site and the type of contaminants and the possible health or safety effects of emergencies involving these contaminants. At this time, the Project Manager and the emergency response units shall make the necessary arrangements to be prepared for any emergencies that could occur.

The Project Manager shall implement the contingency plan whenever conditions at the Site warrant such action. The Project Manager will be responsible for coordination of the evacuation emergency treatment, and transportation of site personnel as necessary, and notification of emergency response units and the appropriate management staff.

EVACUATION

In the event of an emergency situation, such as fire, explosion, or significant release of toxic gases, an air horn or other appropriate device will be sounded for approximately 10 second intervals indicating the initiation of evacuation procedures. All personnel will evacuate and assemble near the entrance to the site. The location shall be upwind of the Site where possible.

For efficient and safe site evacuation and assessment of the emergency situation, the Project Manager will have authority to initiate action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The SSO or designated SSO must ensure that access for emergency equipment is provided and that all combustion apparatuses have been shut down once the alarm has been sounded. Once the safety of all personnel is established, the Fire Department and other emergency response groups as necessary will be notified by telephone of the emergency.

POTENTIAL OR ACTUAL FIRE OR EXPLOSION

Immediately evacuate the Site (air horn will sound for 10-second intervals), notify the local fire and police departments, and other appropriate emergency response groups if an actual fire or explosion has taken place.

PERSONNEL INJURY

Emergency first aid shall be applied on site as deemed necessary. If necessary, the individual shall be decontaminated and transported to the nearest medical facility.

The ambulance/rescue squad shall be contacted for transport as necessary in an emergency. However, since some situations may require transport of an injured party by other means, the hospital route is identified below. A map to this facility provided with this HASP in Section 2.2.3.

ACCIDENT/INCIDENT REPORTING

As soon as first aid and/or emergency response needs have been met, the employer of the injured party must be immediately notified of any incident. Written confirmation of verbal reports is to be submitted within 24 hours. A standard report form entitled "Accident Data

Report" is to be used for this purpose.

For reporting purposes, the term accident refers to fatalities, lost time injuries, spill, or exposure to hazardous materials (toxic materials, explosive or flammable materials).

Any information released from the health care provider, which is not deemed confidential patient information, is to be attached to the appropriate form. Any medical information that is released by patient consent is to be filed in the individuals' medical records and treated as confidential.

OVERT PERSONNEL EXPOSURE

SKIN CONTACT:	Use copious amounts of soap and water. Wash/rinse affected area thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination.
INHALATION:	Move personnel to fresh air and if necessary, decontaminate and transport to hospital.
INGESTION:	Decontamination and transport to emergency medical facility.
PUNCTURE WOUND OR LACERATION:	Decontaminate and transport to emergency medical facility.

ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the SSO or designee will determine if work can continue without sacrificing the health and safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

* Potential for heat stress and heat-related injuries
* Potential for cold stress and cold-related injuries
* Treacherous weather-related conditions
* Limited visibility
* Potential for electrical storms

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lighting. Observe daily weather reports and evacuate if necessary in case of inclement weather conditions.

EMERGENCY RESPONSE EQUIPMENT LIST

Some or all of the following will either be available on-Site or be able to be brought to the Site within a 2-hour period:

* 55 Gallon Drums
* 85 Gallon Drums
* Absorbent Pads
* Absorbent Booms
* Speedy-Dry
* Plastic Sheeting
* Hay Bales

* Pneumatic Nibbler
* Back Hoe
* Pressure Washer
* Air Compressor
* Wilden Pumps
* Equipment Storage Trailer
* Submersible Pumps
* Miscellaneous Hand Tools
* Portable Lighting

LARGE EQUIPMENT
If necessary, the following large equipment will be brought to the Site within 2-hours:

* Large Vacuum Truck
* Super Sucker
* Dump Trucks
* Drill Rig
* Utility Vehicle

14.0 LOGS, REPORTS AND RECORD KEEPING

Medical and Training Records

The Site Superintendent keeps medical and training records. All subcontractors must provide verification of training and medical qualifications to the Site Superintendent. The Site Superintendent will keep a log of personnel meeting appropriate training and medical qualifications for site work. The log will be kept in the project file. Medical records will be maintained in accordance with 29 CFR 1910.20.

Onsite Log

A log of personnel onsite each day will be kept by the Site Superintendent. Originals will be kept in the project file.

Exposure Records

Any monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be kept in accordance with 29 CFR 1910.20. The originals will be sent to the Hydro Tech records coordinator. For subcontractor employees, the original will be sent to the subcontractor employer and a copy kept in the project file.

Accident/Incident Reports

An accident/incident report must be completed for all accidents and incidents. Hydro Tech will send the originals to the appropriate Hydro Tech records coordinator for maintenance. Copies will be distributed as stated. A copy of the forms will be kept in the project file.

OSHA Form 200

An OSHA Form 200 (Log of Occupational Injuries and Illnesses) will be kept at the Site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the Hydro Tech corporate records administrator for maintenance. Subcontractor employers must also meet the requirements of maintaining an OSHA 200 form. The Hydro Tech accident/incident report meets the requirements of the OSHA Form 101 (Supplemental Record) and must be maintained with the OSHA Form 200 for all recordable injuries or illnesses.

Health and Safety Field Log Book

The SSO or designee will maintain the logbook in accordance with standard Hydro Tech procedures. Daily site conditions, activities, personnel, calibration records, monitoring results and significant events will be recorded. The original logbooks will become part of the exposure records file.

15.0 SANITATION

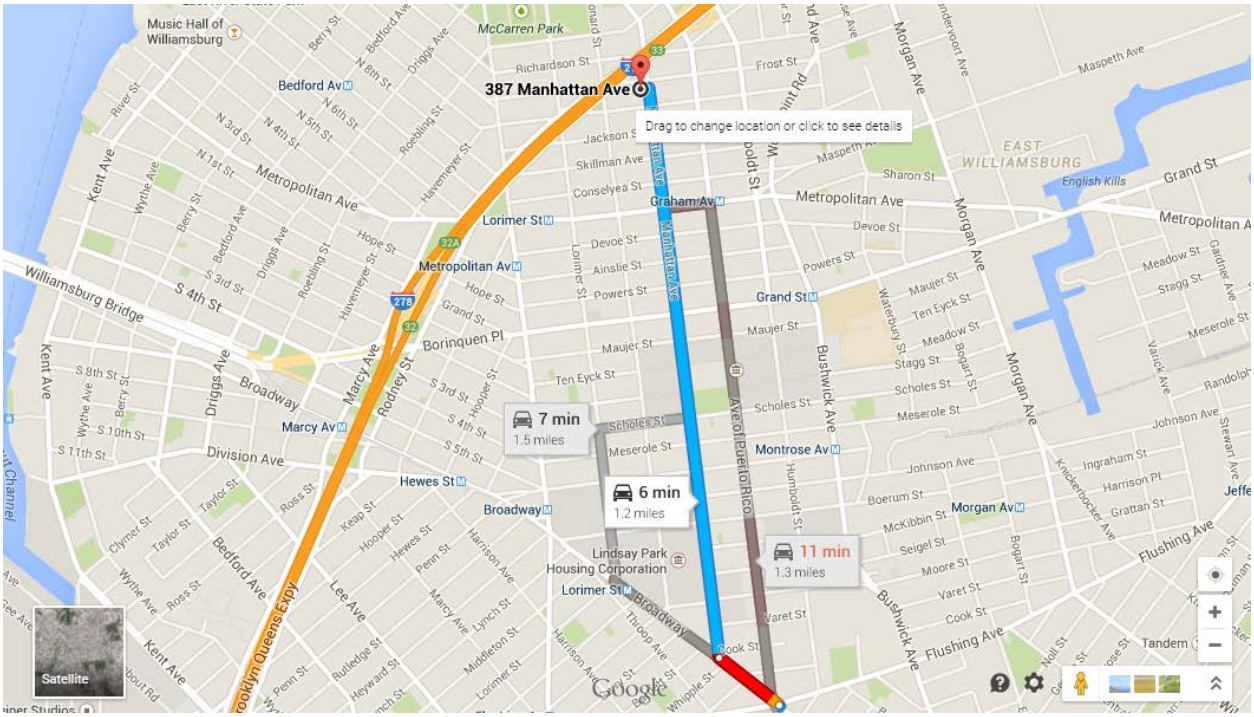
Since sanitary sewer connection has not been established, provisions shall be made for access to sanitary systems by using nearby public facilities consistent with provisions of governing local ordinance codes. This will include the use of outside firms providing and maintaining "Porta Potties" or similar devices.

If a commercial/industrial laundry is used to clean or launder clothing that is potentially contaminated, they shall be informed of the potential harmful effects of exposure to hazardous substances related to the affected clothing.

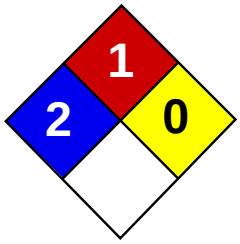
Personnel and subcontractors sites shall follow decontamination procedures described in the Construction HASP. This will generally include, when necessary, site-specific training in shower usage and cleanup, personal hygiene requirements and the donning of protective equipment/clothing.

Figure 1

Directions to Woodland Hospital at 760 Broadway, Brooklyn, NY



ATTACHMENT A
HEALTH AND SAFETY FACT SHEETS



Material Safety Data Sheet
Trichloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Trichloroethylene

Catalog Codes: SLT3310, SLT2590

CAS#: 79-01-6

RTECS: KX4560000

TSCA: TSCA 8(b) inventory: Trichloroethylene

CI#: Not available.

Synonym:

Chemical Formula: C2HCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 420°C (788°F)

Flash Points: Not available.

Flammable Limits: LOWER: 8% UPPER: 10.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/

spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 131.39 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 86.7°C (188.1°F)

Melting Point: -87.1°C (-124.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.4649 (Water = 1)

Vapor Pressure: 58 mm of Hg (@ 20°C)

Vapor Density: 4.53 (Air = 1)

Volatility: Not available.

Odor Threshold: 20 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity:
Extremely corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Trichloroethylene : UN1710 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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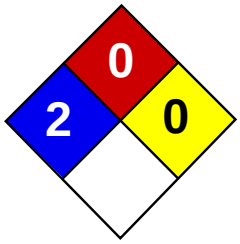

Material Safety Data Sheet
Tetrachloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrachloroethylene

Catalog Codes: SLT3220

CAS#: 127-18-4

RTECS: KX3850000

TSCA: TSCA 8(b) inventory: Tetrachloroethylene

CI#: Not available.

Synonym: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolvel; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

Chemical Name: Ethylene, tetrachloro-

Chemical Formula: C2-Cl4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Tetrachloroethylene	127-18-4	100

Toxicological Data on Ingredients: Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:
Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal.

Taste: Not available.

Molecular Weight: 165.83 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 121.3°C (250.3°F)

Melting Point: -22.3°C (-8.1°F)

Critical Temperature: 347.1°C (656.8°F)

Specific Gravity: 1.6227 (Water = 1)

Vapor Pressure: 1.7 kPa (@ 20°C)

Vapor Density: 5.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 5 - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.4

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium , barium. Protect from light.

Special Remarks on Corrosivity: Slowly corrodes aluminum, iron, and zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Publishe Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects(teratogenic). May affect genetic material (mutagenic). May cause cancer.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symtoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorentiation, seizures, enotional instability, stupor, coma). It may cause pulmonary edema Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver(hepatitis,fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/ central nervous system/peripheral nervous system (impaired memory, numbness of extremeties, peripheral neuropathy and other

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fatthead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Tetrachloroethylene UNNA: 1897 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: g

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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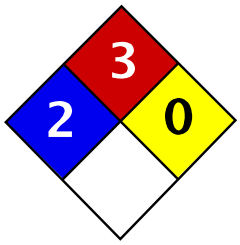

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
p-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: p-Xylene

Catalog Codes: SLX1120

CAS#: 106-42-3

RTECS: ZE2625000

TSCA: TSCA 8(b) inventory: p-Xylene

CI#: Not applicable.

Synonym: p-Methyltoluene

Chemical Name: 1,4-Dimethylbenzene

Chemical Formula: C6H4(CH3)2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{p-}Xylene	106-42-3	100

Toxicological Data on Ingredients: p-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 12400 mg/kg [Rabbit.]. VAPOR (LC50): Acute: 4550 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to blood, kidneys, the nervous system, liver.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV)
TWA: 434 STEL: 651 (mg/m3) from ACGIHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 138°C (280.4°F)

Melting Point: 12°C (53.6°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 9 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Easily soluble in methanol, diethyl ether.
Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 5000 mg/kg [Rat.].
Acute dermal toxicity (LD50): 12400 mg/kg [Rabbit.].
Acute toxicity of the vapor (LC50): 4550 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier.
0900 Detected in maternal milk in human.
Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: p-Xylene
Florida: p-Xylene
Massachusetts RTK: p-Xylene
New Jersey: p-Xylene
TSCA 8(b) inventory: p-Xylene
SARA 313 toxic chemical notification and release reporting: p-Xylene
CERCLA: Hazardous substances.: p-Xylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R10- Flammable.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.
R48/20- Harmful: danger of serious

damage to health by prolonged exposure through inhalation.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du rÃ¨glement sur le transport des marchandises dangeureuses au canada. Centre de conformitÃ© internatinal LtÃ©e. 1986.

Other Special Considerations: Not available.

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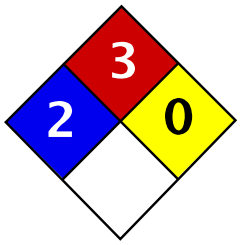

Health	2
Fire	3
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
m-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: m-Xylene

Catalog Codes: SLX1066

CAS#: 108-38-3

RTECS: ZE2275000

TSCA: TSCA 8(b) inventory: m-Xylene

CI#: Not applicable.

Synonym: m-Methyltoluene

Chemical Name: 1,3-Dimethylbenzene

Chemical Formula: C6H4(CH3)2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{m-}Xylene	108-38-3	100

Toxicological Data on Ingredients: m-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit.].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to blood, kidneys, the nervous system, liver.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid, insoluble in water.

Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV)
TWA: 434 STEL: 651 (mg/m3) from ACGIHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 139.3°C (282.7°F)

Melting Point: -47.87°C (-54.2°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 6 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Easily soluble in methanol, diethyl ether.
Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:
Acute oral toxicity (LD50): 5000 mg/kg [Rat.].
Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit.].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier.
0900 Detected in maternal milk in human.
Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: m-Xylene
Massachusetts RTK: m-Xylene
TSCA 8(b) inventory: m-Xylene
SARA 313 toxic chemical notification and release reporting: m-Xylene
CERCLA: Hazardous substances.: m-Xylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R10- Flammable.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du rÃ¨glement sur le transport des marchandises dangeureuses au canada. Centre de conformitÃ© internatinal LtÃ©e. 1986.

Other Special Considerations: Not available.

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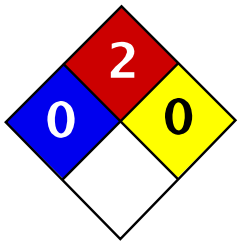

Health	0
Fire	2
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Mesitylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mesitylene

Catalog Codes: SLM2410

CAS#: 108-67-8

RTECS: OX6825000

TSCA: TSCA 8(b) inventory: Mesitylene

CI#: Not available.

Synonym: 1,3,5-Trimethylbenzene

Chemical Formula: C9H12

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mesitylene	108-67-8	100

Toxicological Data on Ingredients: Mesitylene: VAPOR (LC50): Acute: 4881.9 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation (lung irritant). Slightly hazardous in case of skin contact (irritant, permeator), .

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes,

keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 559°C (1038.2°F)

Flash Points: CLOSED CUP: 43°C (109.4°F).

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a

concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Avoid contact with eyes Wear suitable protective clothing If ingested, seek medical advice immediately and show the container or the label.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 25 CEIL: 35 (ppm)
TWA: 125 CEIL: 170 (mg/m3)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 120.2 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 164.7°C (328.5°F)

Melting Point: -44.8°C (-48.6°F)

Critical Temperature: Not available.

Specific Gravity: 0.8637 (Water = 1)

Vapor Pressure: 1.86 mm of Hg (@ 20°C)

Vapor Density: 4.14 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.23 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute toxicity of the vapor (LC50): 4881.9 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation (lung irritant).
Slightly hazardous in case of skin contact (irritant, permeator), .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : 1,3,5-Trimethylbenzene : UN2325 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Florida: Mesitylene
New Jersey: Mesitylene
TSCA 8(b) inventory: Mesitylene

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).

DSCL (EEC):
R10- Flammable.
R36/37- Irritating to eyes and respiratory system.

HMIS (U.S.A.):

Health Hazard: 0

Fire Hazard: 2

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 10/09/2005 06:06 PM

International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

BENZO(B)FLUORANTHENE
Benzo(e)acephenanthrylene
2,3-Benzofluoroanthene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 205-99-2
RTECS # CU1400000
ICSC # 0720

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• **EYES**		Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Tightly closed.	Unbreakable packaging; put breakable packaging into closed unbreakable container.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0720

International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Melting point: 168°C Solubility in water: none	Vapour pressure, Pa at 20°C: <10 Octanol/water partition coefficient as log Pow: 6.04
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0720 **BENZO(B)FLUORANTHENE**

International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

BENZO(K)FLUOROANTHENE
11,12-Benzofluoroanthene
Dibenzo(b,j,k)fluorene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 207-08-9
RTECS # DF6350000
ICSC # 0721

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• **EYES**		Safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Tightly closed.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0721

International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts with strong oxidants. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 215.7°C	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0721 **BENZO(K)FLUORANTHENE**

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

BENZ(a)ANTHRACENE
1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene
$C_{18}H_{12}$
Molecular mass: 228.3

CAS # 56-55-3
RTECS # CV9275000
ICSC # 0385
EC # 601-033-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**		Safety goggles, face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Well closed.	T symbol R: 45 S: 53-45

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0385

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS TO YELLOW-BROWN FLUORESCENT FLAKES OR POWDER.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Sublimation point: 435°C
Melting point: 162°C
Relative density (water = 1): 1.274
Solubility in water: none
Vapour pressure, Pa at 20°C: 292
Octanol/water partition coefficient as log Pow: 5.61

ENVIRONMENTAL DATA

In the food chain important to humans, bioaccumulation takes place, specifically in seafood.

NOTES

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name.

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

Material Safety Data Sheet

Benzo[a]pyrene, 98%

ACC# 37175

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzo[a]pyrene, 98%
Catalog Numbers: AC105600000, AC105600010, AC105601000, AC377200000, AC377200010, AC377201000 AC377201000
Synonyms: 3,4-Benzopyrene; 3,4-Benzpyrene; Benzo[def]chrysene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
50-32-8	Benzo[a]pyrene	>96	200-028-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow to brown powder.
Danger! May cause harm to the unborn child. May impair fertility. May cause eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Cancer hazard. May cause allergic skin reaction. May cause heritable genetic damage.
Target Organs: Reproductive system, skin.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation. May be harmful if absorbed through the skin. May cause an allergic reaction in certain individuals.
Ingestion: May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May be harmful if swallowed.
Inhalation: May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. May be harmful if inhaled.
Chronic: May cause cancer in humans. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs

Benzo[a]pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Benzo[a]pyrene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Powder
Appearance: yellow to brown
Odor: faint aromatic odor
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 495 deg C @ 760 mm Hg
Freezing/Melting Point:175 - 179 deg C
Decomposition Temperature: Not available.
Solubility: 1.60x10-3 mg/l @25°C
Specific Gravity/Density: Not available.
Molecular Formula:C20H12
Molecular Weight:252.31

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 50-32-8: DJ3675000
LD50/LC50:

Not available.

Carcinogenicity:
CAS# 50-32-8:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: Mutagenic effects have occurred in humans.Mutagenic effects have occurred in experimental animals.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 50-32-8: waste number U022.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NOT REGULATED FOR DOMESTIC TRANSPORT	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOL (Benzo{a} pyrene)
Hazard Class:		9
UN Number:		UN3077
Packing Group:		III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 50-32-8 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 50-32-8: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 50-32-8: immediate, delayed.

Section 313

This material contains Benzo[a]pyrene (CAS# 50-32-8, >96%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Benzo[a]pyrene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 50-32-8: 0.06 æg/day NSRL

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 43 May cause sensitization by skin contact.
R 45 May cause cancer.
R 46 May cause heritable genetic damage.
R 60 May impair fertility.
R 61 May cause harm to the unborn child.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou
s waste.
S 61 Avoid release to the environment. Refer to special instructions
/safety data sheets.

WGK (Water Danger/Protection)
CAS# 50-32-8: No information available.

Canada - DSL/NDSL
CAS# 50-32-8 is listed on Canada's DSL List.

Canada - WHMIS
This product has a WHMIS classification of D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List
CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #7 Date: 6/30/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet

Chrysene, 98%

ACC# 95251

Section 1 - Chemical Product and Company Identification

MSDS Name: Chrysene, 98%
Catalog Numbers: AC224140000, AC224140010, AC224140050, AC224145000
Synonyms: 1,2-Benzophenanthrene; Benzo(a)phenanthrene; 1,2,5,6-Dibenzonaphthalene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
218-01-9	Chrysene	98	205-923-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: very light beige solid.
Caution! May cause eye and skin irritation. May cause respiratory tract irritation. May cause cancer in humans.
Target Organs: Liver, skin.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: May cause respiratory tract irritation.
Chronic: May cause cancer according to animal studies.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air

immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: ; Flammability: 1; Instability:

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash hands before eating. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Avoid breathing dust.
Storage: Store in a tightly closed container. Store in a cool, dry area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chrysene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Chrysene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: very light beige
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 448 deg C @ 760 mm Hg
Freezing/Melting Point:250-255 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density: Not available.
Molecular Formula:C18H12
Molecular Weight:228.29

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 218-01-9: GC0700000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 218-01-9:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans

- **California:** carcinogen, initial date 1/1/90
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Chrysene was mutagenic to S. Typhimurium in the presence of an exogenous metabolic system.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Water flea LC50 = 1.9 mg/L; 2 Hr.; Unspecified Fish toxicity : LC50 (96hr) Neauthes arenacedentata >1ppm.(Rossi,S.S. et al Marine Pollut. Bull. 1978) Invertebrate toxicity : lethal treshold concentration (24hr) Daphnia Magna 0,7æg/l.(* Newsted,J.L. et al Environ. Toxicol. Chem. 1987) Bioaccumulation : 24hr Daphnia Magna log bioconcentration factor 3.7845 (*)
Environmental: Degradation studies : biodegradated by white rot fungus (Proc.Annu.Meet.Am.Wood-Preserv.Assoc.1989) May be utilised by axenic cultures of microorganisms e.g. Pseudomonas pancimobilis EPA505, which may have novel degradative systems(Mueller,J.G. et al ppl.Environ.Microbiol.1990; Mueller, J.G. et al Environ.Sci.Technol.1991).
Physical: Not found.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 218-01-9: waste number U050.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 218-01-9 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313

This material contains Chrysene (CAS# 218-01-9, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 218-01-9 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 218-01-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Chrysene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: CAS# 218-01-9: 0.35 æg/day NSRL (oral)

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 45 May cause cancer.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou s waste.

S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 218-01-9: No information available.

Canada - DSL/NDSL

CAS# 218-01-9 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 218-01-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/30/1999
Revision #4 Date: 10/03/2005

Material Safety Data Sheet

Fluoranthene, 98%

ACC# 80991

Section 1 - Chemical Product and Company Identification

MSDS Name: Fluoranthene, 98%
Catalog Numbers: AC119170000, AC119170250, AC119171000, AC119175000
Synonyms: 1,2-(1,8-Naphthalenediyl)benzene; 1,2-(1,8-Naphthylene)benzene; 1,2-Benzacenaphthene; Benzene, 1,2-(1,8-naphthylene)-; Benzo(j,k)fluorene; Benzo(jk)fluoranthene; Benzo(jk)fluorene
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
206-44-0	Fluoranthene	98	205-912-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow needles.
Caution! Harmful. Causes eye and skin irritation and possible burns. May be harmful if absorbed through the skin. May be harmful if swallowed. May cause heart and liver injury.
Target Organs: Heart, liver, lungs.

Potential Health Effects

Eye: Causes eye irritation and possible burns.
Skin: May be harmful if absorbed through the skin. Causes severe skin irritation and possible burns.
Ingestion: May be harmful if swallowed. May cause rapid heartbeat and cardiac arrythmias. May cause liver injury, pulmonary edema, and respiratory arrest. May cause gastrointestinal disturbances such as nausea.
Inhalation: May cause effects similar to those described for ingestion. May produce cardiac failure and pulmonary edema.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the

upper and lower eyelids. Get medical aid imme diately. Do NOT allow victim to rub eyes or keep eyes closed. Extensiv e irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Remove contaminated clothing and shoes.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood. Do not breathe dust.
Storage: Keep containers tightly closed. Store in a cool, dry area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Fluoranthene	none listed	none listed	none listed

OSHA Vacated PELs: Fluoranthene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves and clothing to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Needles
Appearance: yellow
Odor: None reported.
pH: Not available.
Vapor Pressure: 0.01 mm Hg @ 20 deg C
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 384 deg C @ 760.00mmHg
Freezing/Melting Point:107.00 - 110.00 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density:1.252 g/cm3
Molecular Formula:C16H10
Molecular Weight:202.25

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, strong oxidants.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, acrid smoke and fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 206-44-0: LL4025000
LD50/LC50:
CAS# 206-44-0:
Oral, rat: LD50 = 2 gm/kg;

Skin, rabbit: LD50 = 3180 mg/kg;
.

Carcinogenicity:
CAS# 206-44-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: IARC Group 3: Limited or insufficient evidence for carcinogenicity in both animals and humans.Experimental tumorigenic data has been reported.
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Mutation in microorganisms: Salmonella typhimurium = 5ug/plate.Mutation in mammalian somatic cells: Human Lymphocyte = 2 umol/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 3980 um/L; 96 H; (not specified) No data available.
Environmental: Remains in the upper few cm of soil, but can be transported to groundwater. Biodegrades from soil in a few years. Will not volatilize from soil or water. Rapidly absorbed to sediment and particulates and will readily bioconcentrate. Unadsorbed substance in water will degrade by photolysis in a days to weeks. Stable in sediment for decades or more. In the atmostphere, photodegrades with half life of 4 - 5 days, but may transport long distances without settling or raining out.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 206-44-0: waste number U120.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 206-44-0 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 206-44-0: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 206-44-0: immediate.

Section 313

This material contains Fluoranthene (CAS# 206-44-0, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 206-44-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 206-44-0 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 206-44-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 21/22 Harmful in contact with skin and if swallowed.

Safety Phrases:

S 22 Do not breathe dust.
S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 206-44-0: No information available.

Canada - DSL/NDSL

CAS# 206-44-0 is listed on Canada's NDSL List.

Canada - WHMIS

This product has a WHMIS classification of D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 206-44-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #5 Date: 10/03/2005

MSDS Number: **L2347** * * * * * *Effective Date:* ***08/10/04*** * * * * * *Supercedes:* ***11/02/01***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

LEAD METAL

1. Product Identification

Synonyms: Granular lead, pigment metal; C.I. 77575
CAS No.: 7439-92-1
Molecular Weight: 207.19
Chemical Formula: Pb
Product Codes:
J.T. Baker: 2256, 2266
Mallinckrodt: 5668

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Lead	7439-92-1	95 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:

Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.

Ingestion:
POISON! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:
Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation, redness and pain.

Eye Contact:
Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.

Chronic Exposure:
Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted.

Aggravation of Pre-existing Conditions:
Persons with pre-existing kidney, nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Powder/dust is flammable when heated or exposed to flame.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Can produce toxic lead fumes at elevated temperatures and also react with oxidizing materials.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead

metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For lead, metal and inorganic dusts and fumes, as Pb:
-OSHA Permissible Exposure Limit (PEL): 0.05 mg/m3 (TWA)
For lead, elemental and inorganic compounds, as Pb:
-ACGIH Threshold Limit Value (TLV): 0.05 mg/m3 (TWA), A3 animal carcinogen
ACGIH Biological Exposure Indices (BEI): 30 ug/100ml, notation B (see actual Indices for more information).
For lead, inorganic:
-NIOSH Recommended Exposure Limit (REL): 0.1 mg/m3 (TWA)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face high efficiency particulate respirator (NIOSH type N100 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency particulate respirator (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.
Other Control Measures:
Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

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9. Physical and Chemical Properties

Appearance:
Small, white to blue-gray metallic shot or granules.
Odor:
Odorless.
Solubility:
Insoluble in water.
Density:
11.34
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1740C (3164F)
Melting Point:
327.5C (622F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
1.77 @ 1000C (1832F)
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Does not decompose but toxic lead or lead oxide fumes may form at elevated temperatures.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Ammonium nitrate, chlorine trifluoride, hydrogen peroxide, sodium azide, zirconium, disodium acetylide, sodium acetylide and oxidants.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Lead and other smelter emissions are human reproductive hazards. (Chemical Council on

Environmental Quality; Chemical Hazards to Human Reproduction, 1981).
Carcinogenicity:
EPA / IRIS classification: Group B2 - Probable human carcinogen, sufficient animal evidence.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Lead (7439-92-1)	No	No	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to leach into groundwater. This material may bioaccumulate to some extent.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Lead (7439-92-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

	--Canada--

Ingredient	Korea	DSL	NDSL	Phil.
Lead (7439-92-1)	Yes	Yes	No	Yes

\-------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Lead (7439-92-1)	No	No	Yes	No

\-------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Lead (7439-92-1)	10	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

WARNING:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: None allocated.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not

breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:
Laboratory Reagent.

Revision Information:
No Changes.

Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **M1599** * * * * * *Effective Date:* ***12/19/05*** * * * * * *Supercedes:* ***08/10/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

MERCURY

1. Product Identification

Synonyms: Quicksilver; hydrargyrum; Liquid Silver
CAS No.: 7439-97-6
Molecular Weight: 200.59
Chemical Formula: Hg
Product Codes:
J.T. Baker: 2564, 2567, 2569
Mallinckrodt: 1278, 1280, 1288

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Mercury	7439-97-6	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Mercury vapor is highly toxic via this route. Causes severe respiratory tract damage. Symptoms include sore throat, coughing, pain, tightness in chest, breathing difficulties, shortness of breath, headache, muscle weakness, anorexia, gastrointestinal disturbance, ringing in the ear, liver changes, fever, bronchitis and pneumonitis. Can be absorbed through inhalation with symptoms similar to ingestion.

Ingestion:
May cause burning of the mouth and pharynx, abdominal pain, vomiting, corrosive ulceration, bloody diarrhea. May be followed by a rapid and weak pulse, shallow breathing, paleness, exhaustion, tremors and collapse. Delayed death may occur from renal failure. Gastrointenstinal uptake of mercury is less than 5% but its ability to penetrate tissues presents some hazard. Initial symptoms may be thirst, possible abdominal discomfort.

Skin Contact:
Causes irritaton and burns to skin. Symptoms include redness and pain. May cause skin allergy and sensitization. Can be absorbed through the skin with symptoms to parallel ingestion.

Eye Contact:
Causes irritation and burns to eyes. Symptoms include redness, pain, blurred vision; may cause serious and permanent eye damage.

Chronic Exposure:
Chronic exposure through any route can produce central nervous system damage. May cause muscle tremors, personality and behavior changes, memory loss, metallic taste, loosening of the teeth, digestive disorders, skin rashes, brain damage and kidney damage. Can cause skin allergies and accumulate in the body. Repeated skin contact can cause the skin to turn gray in color. A suspected reproductive hazard; may damage the developing fetus and decrease fertility in males and females.

Aggravation of Pre-existing Conditions:
Persons with nervous disorders, or impaired kidney or respiratory function, or a history of allergies or a known sensitization to mercury may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Undergoes hazardous reactions in the presence of heat and sparks or ignition. Smoke may contain toxic mercury or mercuric oxide. Smoke may contain toxic mercury or mercuric oxide.

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6. Accidental Release Measures

Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapor.

Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate misting. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Do not flush to sewer. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker CINNASORB® and RESISORB® are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Do not use or store on porous work surfaces (wood, unsealed concrete, etc.). Follow strict hygiene practices. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Acceptable Ceiling Concentration:
mercury and mercury compounds: 0.1 mg/m3 (TWA), skin
- ACGIH Threshold Limit Value (TLV):
inorganic and metallic mercury, as Hg: 0.025 mg/m3 (TWA) skin, A4 Not classifiable as a human carcinogen.
- ACGIH Biological Exposure Indices:
total inorganic mercury in urine (preshift): 35 ug/g creatinine;
total inorganic mercury in blood (end of shift): 15 ug/l.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face respirator with a mercury vapor or chlorine gas cartridge may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with a mercury vapor or chlorine gas cartridge may be worn up to 50 times the exposure limit, or the maximum use concentraiton specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Silver-white, heavy, mobile, liquid metal.
Odor:
Odorless.
Solubility:
Insoluble in water.
Density:
13.55
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
356.7C (675F)
Melting Point:
-38.87C (-38F)
Vapor Density (Air=1):
7.0
Vapor Pressure (mm Hg):
0.0018 @ 25C (77F)
Evaporation Rate (BuAc=1):
4

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
At high temperatures, vaporizes to form extremely toxic fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Acetylenes, ammonia, ethylene oxide, chlorine dioxide, azides, metal oxides, methyl silane, lithium, rubidium, oxygen, strong oxidants, metal carbonyls.
Conditions to Avoid:
Heat, flames, ignition sources, metal surfaces and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
All forms of mercury can cross the placenta to the fetus, but most of what is known has

been learned from experimental animals. See Chronic Health Hazards.
Carcinogenicity:
EPA / IRIS classification: Group D1 - Not classifiable as a human carcinogen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Mercury (7439-97-6)	No	No	3

12. Ecological Information

Environmental Fate:
This material has an experimentally-determined bioconcentration factor (BCF) of greater than 100. This material is expected to significantly bioaccumulate.
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

International (Water, I.M.O.)

Proper Shipping Name: MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

International (Air, I.C.A.O.)

Proper Shipping Name: MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

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15. Regulatory Information

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--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                    TSCA  EC   Japan  Australia
--------------------------------------------  ----  ---  -----  ---------
Mercury (7439-97-6)                            Yes  Yes   No       Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                      --Canada--
Ingredient                                    Korea  DSL   NDSL  Phil.
--------------------------------------------  -----  ---   ----  -----
Mercury (7439-97-6)                            Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Mercury (7439-97-6)                       No    No      Yes        No

--------\Federal, State & International Regulations - Part 2\----------------
                                                      -RCRA-    -TSCA-
Ingredient                                CERCLA      261.33     8(d)
----------------------------------------  ------      ------    ------
Mercury (7439-97-6)                       1           U151       No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Liquid)
```

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 2Z
Poison Schedule: S7
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
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****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet

Phenanthrene, 90%

ACC# 59921

Section 1 - Chemical Product and Company Identification

MSDS Name: Phenanthrene, 90%
Catalog Numbers: AC130100000, AC130100010, AC130102500
Synonyms:
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
85-01-8	Phenanthrene	90.0	201-581-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: brown solid.
Caution! Powdered material may form explosive dust-air mixtures. May cause allergic skin reaction. May cause eye and skin irritation. May cause respiratory tract irritation. Cancer suspect agent.
Target Organs: None.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation. May cause photosensitive skin reactions in certain individuals.
Ingestion: May cause irritation of the digestive tract.
Inhalation: Inhalation of dust may cause respiratory tract irritation.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dusts at sufficient concentrations can form explosive mixtures with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use water spray or dry chemical.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Phenanthrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Phenanthrene: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: brown
Odor: none reported
pH: Not available.
Vapor Pressure: 1 mm Hg @116c
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 340 deg C
Freezing/Melting Point:101 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density:1.0630g/cm3
Molecular Formula:C14H10
Molecular Weight:178.23

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, dust generation, strong oxidants.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 85-01-8: SF7175000
LD50/LC50:
CAS# 85-01-8:
Oral, mouse: LD50 = 700 mg/kg;
Oral, rat: LD50 = 1.8 gm/kg;
.

Carcinogenicity:
CAS# 85-01-8:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').
- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 85-01-8 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 85-01-8: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 85-01-8: immediate.

Section 313

This material contains Phenanthrene (CAS# 85-01-8, 90.0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 85-01-8 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 85-01-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 45 May cause cancer.

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 85-01-8: No information available.

Canada - DSL/NDSL

CAS# 85-01-8 is listed on Canada's DSL List.

Canada - WHMIS

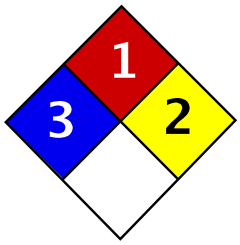
This product has a WHMIS classification of D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 85-01-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/14/1998
Revision #3 Date: 10/03/2005



Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, the nervous system, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not

present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 from ACGIH (TLV) [United States] [1995]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation.
Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic
Pennsylvania RTK: Arsenic
Massachusetts RTK: Arsenic
TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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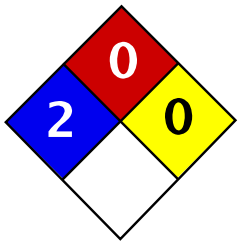

Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Nickel metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel metal

Catalog Codes: SLN2296, SLN1342, SLN1954

CAS#: 7440-02-0

RTECS: QR5950000

TSCA: TSCA 8(b) inventory: Nickel metal

CI#: Not applicable.

Synonym: Nickel Metal shot; Nickel metal foil.

Chemical Name: Nickel

Chemical Formula: Ni

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

Toxicological Data on Ingredients: Nickel metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer).
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to skin.
The substance may be toxic to kidneys, lungs, liver, upper respiratory tract.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating a dust explosion.
Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode.
Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion.
Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation Respirable.
TWA: 0.5 (mg/m3) [United Kingdom (UK)]
TWA: 1 (mg/m3) from OSHA (PEL) [United States] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid. Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 58.71 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 2730°C (4946°F)

Melting Point: 1455°C (2651°F)

Critical Temperature: Not available.

Specific Gravity: Density: 8.908 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water.
Insoluble in Ammonia.
Soluble in dilute Nitric Acid.
Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
Causes damage to the following organs: skin.
May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:

Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose/Conc:
LDL [Rat] - Route: Oral; Dose: 5000 mg/kg
LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Nickel dust and fume can irritate skin.
Eyes: Nickel dust and fume can irritate eyes.
Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis.
Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased cornary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation).
Chronic Potential Health Effects:
Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis.
Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count).
Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy. Chronic ingestion of NIckel may also affect respiration and cause pneumoconiosis or fibrosis.
Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal
Connecticut hazardous material survey.: Nickel metal
Illinois toxic substances disclosure to employee act: Nickel metal
Illinois chemical safety act: Nickel metal
New York release reporting list: Nickel metal
Rhode Island RTK hazardous substances: Nickel metal
Pennsylvania RTK: Nickel metal
Michigan critical material: Nickel metal
Massachusetts RTK: Nickel metal
Massachusetts spill list: Nickel metal
New Jersey: Nickel metal
New Jersey spill list: Nickel metal
Louisiana spill reporting: Nickel metal
California Director's List of Hazardous Substances: Nickel metal
TSCA 8(b) inventory: Nickel metal

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects.
R43- May cause sensitization by skin contact.
S22- Do not breathe dust.
S36- Wear suitable protective clothing.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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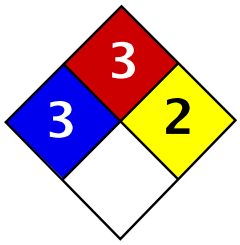

Health	3
Fire	3
Reactivity	2
Personal Protection	J

Material Safety Data Sheet
Calcium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Calcium

Catalog Codes: SLC2782

CAS#: 7440-70-2

RTECS: EV8040000

TSCA: TSCA 8(b) inventory: Calcium

CI#: Not available.

Synonym:

Chemical Formula: Ca

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Calcium	7440-70-2	100

Toxicological Data on Ingredients: Calcium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to lungs, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid. Flammable solid that, in contact with water, emits flammable gases.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as acids, moisture.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 40.08 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 1484°C (2703.2°F)

Melting Point: 839°C (1542.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.54 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Not available.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with acids.
Reactive with moisture.
The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Calcium : UN1401 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Calcium
Massachusetts RTK: Calcium
TSCA 8(b) inventory: Calcium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material.
CLASS E: Corrosive solid.

DSCL (EEC): R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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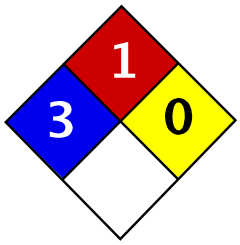

Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, liver.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 (ppm)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 890 mg/kg [Mouse].
Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.
The substance is toxic to kidneys, lungs, liver.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium
Pennsylvania RTK: Cadmium
Massachusetts RTK: Cadmium
TSCA 8(b) inventory: Cadmium
SARA 313 toxic chemical notification and release reporting: Cadmium
CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R26- Very toxic by inhalation.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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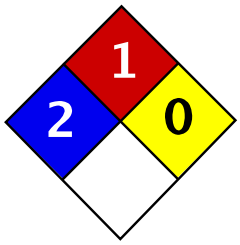
Last Updated: 11/06/2008 12:00 PM



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper

Catalog Codes: SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

CAS#: 7440-50-8

RTECS: GL5325000

TSCA: TSCA 8(b) inventory: Copper

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Cu

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper	7440-50-8	100

Toxicological Data on Ingredients: Copper LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to lungs, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH [1990]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 63.54 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 2595°C (4703°F)

Melting Point: 1083°C (1981.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.94 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion.
Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Copper
Massachusetts RTK: Copper
TSCA 8(b) inventory: Copper
CERCLA: Hazardous substances.: Copper

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator

when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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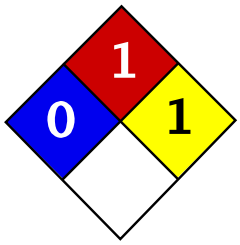

Health	1
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Magnesium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium

Catalog Codes: SLM4408, SLM2263, SLM3637

CAS#: 7439-95-4

RTECS: OM2100000

TSCA: TSCA 8(b) inventory: Magnesium

CI#: Not applicable.

Synonym: Magnesium ribbons, turnings or sticks

Chemical Name: Magnesium

Chemical Formula: Mg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Magnesium	7439-95-4	100

Toxicological Data on Ingredients: Magnesium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at

least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat.
Flammable in presence of acids, of moisture.
Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Explosive in presence of acids, of moisture.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air.
Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas with is highly flammable and eplosive

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid.
Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Dangerous when wet.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 24.31 g/mole

Color: Silver-white

pH (1% soln/water): Not applicable.

Boiling Point: 1100°C (2012°F)

Melting Point: 651°C (1203.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.74 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Very slightly soluble in hot water.
Insoluble in cold water.
Insoluble in chromium trioxides, and mineral acids, alkalies.
Slightly soluble with decomposition in hot water.
Soluble in concentrated hydrogen fluoride, and ammonium salts.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, incompatible materials, water or moisture, moist air.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent chemical reaction with oxidizing agents.
Reacts with water to create hydrogen gas and heat. Must be kept dry.
Reacts with acids to form hydrogen gas which is highly flammable and explosive.
Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphodiiodide; bromobenzyl trifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide; zinc oxide.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritation by mechanical action. May get mechanical injury or embedding of chips/particles in skin. The particles that are embedded in the wounds may retard healing.
Eyes: May cause eye irritation by mechanical action. Mechanical injury may occur. Particles or chips may embed in eye and retard healing.
Inhalation: Low hazard for ususal industrial handling. It may cause respiratory tract irritation. However, it is unlikely due to physical form. When Magnesium metal is heated during welding or smelting process, Metal Fume Fever may result from inhalation of magnesium fumes. Metal Fume Fever is a flu-like condition consisting of fever, chills, sweating, aches, pains, cough, weakness, headache, nausea, vomiting, and breathing difficulty. Other symptoms may include metallic taste, increased white blood cell count. There is no permanent ill-effect.
Ingestion: Low hazard for usual industrial handling. There are no known reports of serious industrial poisonings with Magnesium. Ingeston of large amounts of chips, turnings or ribbons may cause gastrointestinal tract irritation with nausea, vomiting, and diarrhea. Acute ingestion may also result in Hypermagnesia. Hypermagnesia may cause hypotension, bradycardia, CNS depression, respiratory depression, and impairment of neuromuscular transmission (hyporeflexia, paralysis).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Magnesium UNNA: 1869 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Magnesium
Rhode Island RTK hazardous substances: Magnesium
Pennsylvania RTK: Magnesium

Massachusetts RTK: Magnesium
Massachusetts spill list: Magnesium
New Jersey: Magnesium
TSCA 8(b) inventory: Magnesium

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid.
CLASS B-6: Reactive and very flammable material.

DSCL (EEC):
R11- Highly flammable.
R15- Contact with water liberates extremely flammable gases.
S7/8- Keep container tightly closed and dry.
S43- In case of fire, use dry chemical. Never use water.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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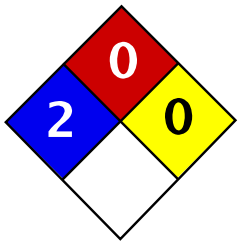

Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Nickel metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel metal

Catalog Codes: SLN2296, SLN1342, SLN1954

CAS#: 7440-02-0

RTECS: QR5950000

TSCA: TSCA 8(b) inventory: Nickel metal

CI#: Not applicable.

Synonym: Nickel Metal shot; Nickel metal foil.

Chemical Name: Nickel

Chemical Formula: Ni

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

Toxicological Data on Ingredients: Nickel metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer).
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to skin.
The substance may be toxic to kidneys, lungs, liver, upper respiratory tract.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating a dust explosion.
Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode.
Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion.
Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation Respirable.
TWA: 0.5 (mg/m3) [United Kingdom (UK)]
TWA: 1 (mg/m3) from OSHA (PEL) [United States] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid. Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 58.71 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 2730°C (4946°F)

Melting Point: 1455°C (2651°F)

Critical Temperature: Not available.

Specific Gravity: Density: 8.908 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water.
Insoluble in Ammonia.
Soluble in dilute Nitric Acid.
Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
Causes damage to the following organs: skin.
May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:

Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose/Conc:
LDL [Rat] - Route: Oral; Dose: 5000 mg/kg
LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Nickel dust and fume can irritate skin.
Eyes: Nickel dust and fume can irritate eyes.
Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis.
Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased cornary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation).
Chronic Potential Health Effects:
Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis.
Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count).
Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy. Chronic ingestion of NIckel may also affect respiration and cause pneumoconiosis or fibrosis.
Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal
Connecticut hazardous material survey.: Nickel metal
Illinois toxic substances disclosure to employee act: Nickel metal
Illinois chemical safety act: Nickel metal
New York release reporting list: Nickel metal
Rhode Island RTK hazardous substances: Nickel metal
Pennsylvania RTK: Nickel metal
Michigan critical material: Nickel metal
Massachusetts RTK: Nickel metal
Massachusetts spill list: Nickel metal
New Jersey: Nickel metal
New Jersey spill list: Nickel metal
Louisiana spill reporting: Nickel metal
California Director's List of Hazardous Substances: Nickel metal
TSCA 8(b) inventory: Nickel metal

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects.
R43- May cause sensitization by skin contact.
S22- Do not breathe dust.
S36- Wear suitable protective clothing.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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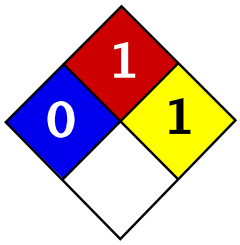

Health	1
Fire	1
Reactivity	1
Personal Protection	E

Material Safety Data Sheet
Zinc Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc Metal

Catalog Codes: SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

CAS#: 7440-66-6

RTECS: ZG8600000

TSCA: TSCA 8(b) inventory: Zinc Metal

CI#: Not applicable.

Synonym: Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

Chemical Name: Zinc Metal

Chemical Formula: Zn

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Zinc Metal	7440-66-6	100

Toxicological Data on Ingredients: Zinc Metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture.
Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Zinc + NaOH causes ignition.
Oxidation of zinc by potassium proceeds with incandescence.
Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper.
Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined.
When hydrazine mononitrate is heated in contact with zinc, a flamming decomposition occurs at temperatures a little above its melting point.
Contact with acids and alkali hydroxides (sodium hydroxide, postasium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas.
Zinc foil ignites if traces of moisture are present.
It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or

moist air.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid. Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 65.39 g/mole

Color: Bluish-grey

pH (1% soln/water): Not applicable.

Boiling Point: 907°C (1664.6°F)

Melting Point: 419°C (786.2°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, moisture

Incompatibility with various substances:
Reactive with oxidizing agents, acids, alkalis.
Slightly reactive to reactive with moisture.
The product may react violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with acids, halogenated hydrocarbons, NH_4NO_3, barium oxide, $Ba(NO_3)_2$, Cadmium, CS_2, chlorates, Cl_2, CrO_3, F_2, Hydroxylamine, $Pb(N_3)_2$, $MnCl_2$, HNO_3, performic acid, $KClO_3$, KNO_3, N_2O_2, Selenium, $NaClO_3$, Na_2O_2, Sulfur, Te, water, $(NH_4)_2S$, As_2O_3, CS_2, $CaCl_2$, chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide, HCl, H_2SO_4, (Mg +$Ba(NO_3)_2$ +BaO_2), (ethyl acetoacetate +tribromoneopentyl alcohol.
Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen.
Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide.
May react with water.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss.
Eyes: May cause eye irritation.
Ingestion: May be harmul if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizzness, irritability, muscular stiffness, and pain. May also affect blood.
Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis.
The toxicological properties of this substance have not been fully investisgated.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

New York release reporting list: Zinc Metal
Rhode Island RTK hazardous substances: Zinc Metal
Pennsylvania RTK: Zinc Metal
Florida: Zinc Metal
Michigan critical material: Zinc Metal
Massachusetts RTK: Zinc Metal
New Jersey: Zinc Metal
California Director's List of Hazardous Substances: Zinc Metal
TSCA 8(b) inventory: Zinc Metal
TSCA 12(b) one time export: Zinc Metal
SARA 313 toxic chemical notification and release reporting: Zinc Metal
CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not Available

DSCL (EEC):
R15- Contact with water liberates
extremely flammable gases.
R17- Spontaneously flammable in air.
S7/8- Keep container tightly closed and dry.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 1

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an
approved/certified respirator or
equivalent.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Department of Health and Human Services
Agency for Toxic Substances & Disease Registry

ToxFAQs™: Chemical Agent Briefing Sheets (CABS)

Lead

January 2006

PDF Version

What is lead?

Lead is a heavy, bluish-gray metal that has a low melting point. It occurs naturally in the Earth' s crust, but it is not a particularly abundant element. It is rarely found naturally as a metal, but rather in its divalent (2+) oxidative state in ore deposits widely distributed throughout the world. The most im portant lead containing ores are galena (PbS), anglesite ($PbSO_4$), and cerussite ($PbCO_3$). Natural lead is a mixture of four stable isotopes: ^{208}Pb (51%–53%), ^{206}Pb (23.5%–27%), ^{207}Pb (20.5%–23%), and ^{204}Pb (1.35%–1.5%).

What are the forms of lead?

- Metallic lead
- Inorganic lead and lead compounds (or lead salts)
- Organic lead (containing carbon)

What are the common uses of lead?

The largest use for lead is in storage batteries in cars and other vehicles. Lead may be used as a pure metal, alloyed with other metals, or as chemical compounds.

Lead used by industry comes from mined ores ("primary") or from recycled scrap metal or batteries ("secondary"). However, most lead today is obtained from recovery of recycled scrap, mostly lead-a cid batteries.

Human activities, such as lead mining and smelting operations and manufacturing and use of lead products (*e.g.*, leaded gasoline, lead-based paint), have resulted in the contamination of many industrial and residential areas with lead.

Form	Uses
Metallic lead **Lead and lead compounds (or lead salts), such as** • **lead acetate** • **lead chloride** • **lead nitrate** • **lead oxide** • **lead phosphate** • **lead acetate**	Certain uses of lead, such as leaded gasoline, lead-based paints for domestic use, lead-based solder in food cans and water pipes, lead sinkers, and ammunition, have been reduced or banned to minimize lead's harmful effects on people and animals. • **Cosmetics and hair dye** - Some hair dyes and some non-Western cosmetics, such as kohl and surma, contain lead. • **Fishing equipment** - Most fishing weights and sinkers are made from lead. • **Folk remedies** - Many non-Western folk remedies used to treat diarrhea or other ailments may contain substantial amounts of lead. Examples of these include alarcon, ghasard, alkohl, greta, azarcon,

• **lead sulfate** • **lead sulfide**	liga, bali goli, pay-loo-ah, coral, and rueda. • **Glazing** - Applied to some ceramicware can contain lead. • **Lead based paint** - Although the sale of residential lead-based paint was banned in the United States in 1978, it remains a major source of lead exposure for young children residing in older houses. • **Lead batteries** - Production of lead-acid batteries is the major use of lead. • **Lead-based solder** - Has been banned for use in water distribution systems, but many buildings and homes contain lead pipes or lead-based solder. Lead-based solder also is used for electrical circuitry applications. • **Lead-shot** and **ammunition** - It is the second highest production use of lead. • Other uses of lead include the production of lead alloys, soldering materials, shielding for x-ray machines, and manufacturing of corrosion- and acid-resistant materials used in the building industry.
Organic • **tetraethyl lead** • **tetramethyl lead**	The use of lead in gasoline was phased out in the 1980s, and has been banned since January 1, 1996. The use of lead in gasoline has contributed to its dispersion throughout the environment. During the combustion of gasoline containing these alkyllead compounds, significant amounts of inorganic lead can be released to the surrounding areas. **Current Uses** • Gasoline for off-road vehicles, farm equipment, and airplanes **Past Uses** • Gasoline additives (to increase octane rating)

What are the routes of exposure for lead?

People are most likely to be exposed to lead by consuming contaminated food and drinking water. Exposure can also occur by inadvertently ingesting contaminated soil, dust, or lead-based paint.

Form	Routes of Exposure
Metallic lead **Lead and lead compounds (or lead salts), such as** • **lead acetate** • **lead chloride** • **lead nitrate** • **lead oxide** • **lead phosphate** • **lead subacetate** • **lead sulfate** • **lead sulfide**	• Ingestion is the primary source of exposure to the general population. • Lead paint is a major source of environmental exposure for children who ingest flaking paint, paint chips, and weathered powdered paint (mostly from deteriorated housing units in urban areas). Lead paint can also contribute to soil/dust lead which can be inadvertently ingested via hand-to-mouth activity of young children. • Lead can leach into drinking water from lead-based solder used in water pipes. • Lead can leach into foods or liquids stored in ceramic containers made with lead glazing. • Engaging in hobbies such as casting ammunition, making fishing weights, and stained glass can result in exposure to lead. • Exposure by inhalation can result during activities such as soldering with lead solder or sanding or sandblasting lead-based paint.
Organic • **tetraethyl lead** • **tetramethyl lead**	• Inhalation • Dermal studies in animals have shown that organic lead is well absorbed through the skin

Who are the populations most at risk and how are they usually exposed?

People living near hazardous waste sites, lead smelters or refineries, battery recycling or crushi ng centers, or other industrial lead sources may be exposed to lead and chemicals that contain lead. Workers in occupations that have sources of lead exposure (*e.g.*, plumbers, miners, mechanics, and lead smelter or refinery workers).

Certain hobbies, folk remedies, home activities, and car repairs (*e.g.*, radiator repair) can contribute to lead exposure. Smoking cigarettes or breathing second-hand smoke increases exposure because tobacco smoke contains small amounts of lead.

Pregnant women, the developing fetuses, and young children are particularly vulnerable to the effe cts of lead. Young children are more likely to play in dirt and to place their hands and other objects in their

mouths, thereby increasing the opportunity for exposure via ingestion of lead-contaminated soil an d dust.

What are the possible toxic effects of lead?

The most sensitive targets for lead toxicity are the developing nervous system, the hematological and cardiovascular systems, and the kidney. However, because of lead's many modes of action in biologi cal systems, lead could potentially affect any system or organs in the body. The effects are the same whether it is breathed or swallowed.

Blood Lead Concentrations Corresponding to Adverse Health Effects

Life Stage	Effect	Blood lead (µg/dL)
Children	Depressed ALAD* activity	<5
	Neurodevelopmental effects	<10
	Sexual maturation	<10
	Depressed vitamin D	>15
	Elevated EP**	>15
	Depressed NCV***	>30
	Depressed hemoglobin	>40
	Colic	>60
Adults	Depressed GFR****	<10
	Elevated blood pressure	<10
	Elevated EP (females)	>20
	Enzymuria/proteinuria	>30
	Peripheral neuropathy	>40
	Neurobehavioral effects	>40
	Altered thyroid hormone	>40
	Reduced fertility	>40
	Depressed hemoglobin	>50
Elderly adults	Depressed ALAD*	<5
	Neurobehavioral effects	>4

*aminolevulinic acid dehydratase (ALAD)

**erythrocyte porphyrin (EP)

***nerve conduction velocity (NCV)

****glomerular filtration rate (GFR)

Source: ATSDR Toxicological Profile for Lead (Draft for Public Comment), 2005.

How can I reduce the risk of exposure to lead?

- Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint (homes built before 1978).
- If you have a water lead problem, the U.S. Environmental Protection Agency (EPA) recommends that you flush your cold water pipes if they have not been used in over 6 hours by running water until it is cold (5 seconds to 2 minutes) before drinking or cooking with it.
- Avoid some types of paints and pigments that contain lead and are used as make-up or hair coloring; keep these kinds of products away from children.
- Hire a professional contractor, who is required to follow certain health safety requirements for remediation or renovation involving lead-based paint, (www.epa.gov/lead/pubs/leadinfo.htm#remodeling).
- Wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

What are the safety guidelines for lead exposure?

Air

- National Institute for Occupational Safety and Health (NIOSH)

  Recommended exposure limit (REL) time-weighted average (TWA) - 0.05 mg/m^3
  Immediately dangerous to life or health (IDLH) - 100 mg/m^3

- Occupational Safety and Health Administration (OSHA)

  Air - workplace 50 $\mu g/m^3$
  Action level - 40 µg/100 g of whole blood

- The American Conference of Governmental Industrial Hygienists (ACGIH)

Threshold limit values (TLV)/(TWA) - 0.05 mg/m^3
TLV/TWA guideline for lead arsenate - 150 µg/m^3
TLV/TWA guideline for other forms of lead - 50 µg lead/m^3

- U.S. Environmental Protection Agency (EPA)

  National Primary and Secondary Ambient Air Quality Standards - 1.5 µg/m^3

- World Health Organization (WHO)

  Air quality guidelines -- 0.5 µg/m^3

Water

- EPA

  Maximum contaminant level (MCL) - action level 0.015 mg/L
  Action level for public supplies - 15 µg/L

- WHO

  Drinking Water Quality Guidelines - 0.01 mg/L

Blood

- Centers for Disease Control and Prevention (CDC)

  Level of concern for children - 10 µg/dL

- OSHA

  Cause for written notification and medical exam - 40 µg/dL
  Cause for medical removal from exposure - 50 µg/dL

- ACGIH

  Advisory; biological exposure index - 30 µg/dL

Food

- Food and Drug Administration (FDA)

  Bottled drinking water - 0.005 mg/L

Other

- ACGIH

  Biological exposure indices (lead in blood) - 30 µg/100 mL

- Consumer Product Safety Commission

  Paint - 600 ppm

- FDA

  Ceramicware (µg/mL leaching solution) - 0.5-3.0 µg/mL

µg/m^3: micrograms per cubic meter
µg/dL: micrograms per deciliter
µg/L: micrograms per liter
g: gram
mg/L: milligrams per liter
mL: milliliter
ppm: parts per million

What are the most important or common mediating factors?

Factors that determine the severity of the health effects from lead exposure include

- Dose
- Age of the person exposed
  - the developing nervous system is the most sensitive system to the effects of lead
  - the efficiency of lead absorption from the gastrointestinal tract is greater in children than in adults
- Life stages of women (childbirth, lactating, menopause)
- Occupational exposures
- Duration of exposure
- Health and lifestyle of the person exposed
- Nutritional status of the person exposed
  - a diet adequate in calcium and iron may decrease lead absorption

The toxic effects of lead exposure may be worse in individuals with inherited genetic diseases or gene polymorphisms such as thalassemia, individuals with glucose-6-phosphate dehydrogenase (G6PD) deficiency, and carriers of certain gene polymorphic forms (*e.g.*, ALAD and vitamin D receptor). Research continues about this topic.

Is there a test to see if my child or I have been exposed to lead?

Blood	• The screening test of choice is blood lead levels. • Blood tests are commonly used to screen children for lead poisoning. • Analysis of lead in whole blood is the most common and accurate method of assessing lead exposure. • Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL).
Bone and Teeth	• X-ray fluorescence techniques have been used to determine lead concentration in bones and teeth. It is not widely available and is used mostly in research. • Lead partitions to bone over a lifetime of exposure; therefore, bone lead measurements may be a better indicator of cumulative exposure than blood lead.
Urine	• Measurements of urinary lead levels have been used to assess lead exposure. • The measurement of lead excreted in urine following chelation with calcium disodium EDTA (EDTA provocation) has been used to detect elevated body burden of lead in adults and children.
Hair and Nails	• These are not reliable for testing due to errors external contamination. They are relatively poor predictors of blood lead, particularly at low concentrations.

Future Research Needs

To close current gaps in the scientific database on the health effects of lead, a long–term resear ch program is needed that might include the following:

- Further short-term studies or studies in vitro designed to clarify mechanisms of action for the various toxicities might be useful.
- Studies identifying exposures during different developmental periods can help identify critical periods of vulnerability for immunocompetence, development of sex organs, or neurobehavioral parameters.
- Chronic-duration exposure studies in animals would expand information on the toxicity of lead. Special studies that examine biochemical and morphological effects of lead may provide new information on mechanisms of action of lead, particularly for the effects of greatest concern such as neurobehavioral changes in children.
- Development of new and more sensitive tests of specific neuropsychological functions.
- Further investigation of links between lead and amyotrophic lateral sclerosis, essential tremor, schizophrenia, and Parkinson's disease.
- Epidemiological studies designed in a manner that permits more rigorous assessments of effect modification.
- Studies about the long-term consequences of lead-related neurobehavioral deficits detected in infants and children and the manifestation of chronic neurobehavioral problems in adolescence and adulthood.
- Further characterization of bone lead concentration as a biomarker of exposure for various effect end points (*e.g.*, blood pressure and renal effects).
- Studies of the potential prevalence of elevated bone lead stores in women of reproductive age and the associated risk that this poses to fetal development by mobilization of maternal bone stores during pregnancy.
- Further clarification of the role of some genetic polymorphisms.
- Evaluation of cohorts from prospective studies into adulthood for potential late-appearing effects including cancer.

For more information

- Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile for Lead

  http://www.atsdr.cdc.gov/toxprofiles/tp13.html

- ATSDR ToxFAQs™ for Lead

  http://www.atsdr.cdc.gov/tfacts13.html

- ATSDR Case Studies in Environmental Medicine Lead Toxicity

  http://www.atsdr.cdc.gov/csem/lead/

- ATSDR Interaction Profile for Chemical Mixtures for Arsenic, Cadmium, Chromium, and Lead

  http://www.atsdr.cdc.gov/interactionprofiles/ip04.html

- ATSDR Interaction Profile for Chemical Mixtures for Lead, Manganese, Zinc, and Copper

  http://www.atsdr.cdc.gov/interactionprofiles/ip06.html

- ATSDR Interaction Profile for Chemical Mixtures for Chlorpyrifos, Lead, Mercury, and Methylmercury

  http://www.atsdr.cdc.gov/interactionprofiles/ip11.html

- Centers for Disease Control and Prevention Lead Web Page

  http://www.cdc.gov/lead/

- U.S. Environmental Protection Agency Lead Web Page

  http://www.epa.gov/lead/

- U.S. Department of Labor, Occupational Safety & Health Administration

  http://www.osha.gov/SLTC/lead/

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333
Phone: 1-800-CDC-INFO (800-232-4636)
TTY 888-232-6348

FAX: (770)-488-4178
Email: CDCINFO@cdc.gov

This page was updated on 01/04/2008

Mercury

Mercury is a naturally occurring metal found in air, water, and soil. It exists in several forms, including elemental (or metallic) mercury, inorganic mercury compounds, and organic mercury compounds:

- **Elemental mercury** is liquid at room temperature and is used in thermometers, fluorescent light bulbs, some electrical switches, and some industrial processes.
- **Inorganic mercury** compounds are formed when mercury combines with other elements to form salts, which are usually powders or crystals. Inorganic mercury compounds are found naturally in the environment. Some forms of inorganic mercury have been used in antiseptic creams, ointments, and preservatives.
- **Organic mercury** compounds are formed when mercury combines with carbon. Microscopic organisms can produce organic mercury compounds (methylmercury) in contaminated water and soil, which can accumulate in the food chain. Other special types of organomercurials have been used as medical preservatives and medicines.

How People Are Exposed to Mercury

- Eating fish or shellfish that is contaminated with methylmercury, which is the main source of general human exposures to mercury;
- Breathing air contaminated with elemental mercury vapors (e.g., in workplaces such as dental offices and industries that use mercury or in locations where a mercury spill or release has occurred);
- Having dental fillings that contain mercury; and
- Practicing cultural or religious rituals that use mercury.

How Mercury Affects People's Health

- Short-term exposure to extremely high levels of elemental mercury vapors can result in lung damage, nausea, diarrhea, increases in blood pressure or heart rate, skin rashes, eye irritation, and injury to the nervous system.
- Prolonged exposure to lower levels of elemental mercury can permanently damage the brain and kidneys.
- The developing brain of a fetus can be injured if the mother is exposed to methylmercury.

Levels of Mercury in U.S. Population

Scientists tested levels of mercury in the blood of 16,780 participants who took part in CDC's national study known as the National Health and Nutrition Examination Survey (NHANES). These findings are based on total blood mercury levels in the U.S. general

population for persons aged 1 year and older who participated in NHANES during 2003-2006, as well as trends in the total mercury of children aged 1–5 and females aged 16–49 during 1999–2006.

- In the total population during 2003–2006, the total blood mercury levels for non–Hispanic blacks and non–Hispanic whites were higher than those for Mexican Americans.
- Across the age groups in the total population during 2003-2006, total blood mercury levels increased with age, peaked at the fifth or sixth decade, depending on race/ethnicity, and then declined.
- In the most recent survey period of 2005–2006, the 95th percentile levels for total blood mercury in children aged 1-5 years and females aged 16-49 years were 1.43 µg/L and 4.48 µg/L, respectively. The 95th percentile means that 95 percent of the U.S. population's exposure is below this estimated level. Conversely, only 5 percent of the population will have values at this level or higher.
- Over the four survey periods from 1999-2006, blood mercury levels increased slightly for non–Hispanic white children and decreased slightly for non–Hispanic black and Mexican American children. Female children had slightly higher blood mercury levels than male children.

For More Information

- Agency for Toxic Substances and Disease Registry
  Detailed information about mercury and public health is available at
  http://www.atsdr.cdc.gov/alerts/970626.html and
  http://www.atsdr.cdc.gov/cabs/mercury/index.html
- CDC Emergency Preparedness and Response
  Case definitions of mercury, toxicology FAQs, and toxicological profile at
  http://emergency.cdc.gov/agent/mercury/

May 2009

Department of Health and Human Services
Agency for Toxic Substances & Disease Registry

ATSDR Home › ToxFAQs™ Arsenic

ToxFAQs™

ToxFAQs™
for
Arsenic
(*Arsénico*)
August 2007

PDF Version, 92 KB

CAS#: 7440-38-2

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

Highlights

Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause naus ea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of “pins an d needles” in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of th e skin and the appearance of small “corns” or “warts” on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies i n animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cance r and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for R esearch on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How does arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ score s. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant fem ales, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal ti ssues. Arsenic is found at low levels in breast milk.

How can families reduce their risk for exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protecti ve clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner source s of water and limit contact with soil.
- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on y our clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to show whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urin e test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of ars enic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environ ment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic *(Update)*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE, Mailstop F-62
Atlanta, GA 30333
Phone: 1-800-CDC-INFO • 888-232-6348 (TTY)
FAX: 770-488-4178
Email: cdcinfo@cdc.gov

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state heal th or environmental quality department if you have any more questions or concerns.

This page was updated on 10/05/2007

U.S. Environmental Protection Agency

Pesticides: Topical & Chemical Fact Sheets

Assessing Health Risks from Pesticides

January 1999
735-F-99-002

The Federal Government, in cooperation with the States, carefully regulates pesticides to ensure that they do not pose unreasonable risks to human health or the environment. As part of that effort, the Environmental Protection Agency (EPA) requires extensive test data from pesticide producers that demonstrate pesticide products can be used without posing harm to human health and the environment. EPA scientists and analysts carefully review these data to determine whether to register (license) a pesticide product or a use and whether specific restrictions are necessary. This fact sheet is a brief overview of EPA's process for assessing potential risks to human health when evaluating pesticide products.

Background

There are more than 865 active ingredients registered as pesticides, which are formulated into thousands of pesticide products that are available in the marketplace. About 350 pesticides are used on the foods we eat, and to protect our homes and pets.

EPA plays a critical role in evaluating these chemicals prior to registration, and in reevaluating older pesticides already on the market, to ensure that they can be used with a reasonable certainty of no harm. The process EPA uses for evaluating the health impacts of a pesticide is called risk assessment.

EPA uses the National Research Council's four-step process for human health risk assessment:

Step One: Hazard Identification
Step Two: Dose-Response Assessment
Step Three: Exposure Assessment
Step Four: Risk Characterization

Step One: Hazard Identification (Toxicology)

The first step in the risk assessment process is to identify potential health effects that may occur from different types of pesticide exposure. EPA considers the full spectrum of a pesticide's potential health effects.

Generally, for human health risk assessments, many toxicity studies are conducted on animals by pesticide companies in independent laboratories and evaluated for acceptability by EPA scientists. EPA evaluates pesticides for a wide range of adverse effects, from eye and skin irritation to cancer and birth defects in laboratory animals. EPA may also consult the public literature or other sources of supporting information on any aspect of the chemical.

Step Two: Dose-Response Assessment

Paracelsus, the Swiss physician and alchemist, the "father" of modern toxicology (1493-1541) said,

> "The dose makes the poison."

In other words, **the amount of a substance a person is exposed to** is as important as **how toxic the chemical might be**. For example, small doses of aspirin can be beneficial to people, but at very high doses, this common medicine can be deadly. In some individuals, even at very low doses, aspirin may be deadly.

Dose-response assessment involves considering the dose levels at which adverse effects were observed in test animals, and using these dose levels to calculate an equal dose in humans.

Step Three: Exposure Assessment

People can be exposed to pesticides in three ways:

1. Inhaling pesticides (inhalation exposure),
2. Absorbing pesticides through the skin (dermal exposure), and
3. Getting pesticides in their mouth or digestive tract (oral exposure).

Depending on the situation, pesticides could enter the body by any one or all of these routes. Typical sources of pesticide exposure include:

- **Food**
  Most of the foods we eat have been grown with the use of pesticides. Therefore, pesticide residues may be present inside or on the surfaces of these foods.

- **Home and Personal Use Pesticides**
  You might use pesticides in and around your home to control insects, weeds, mold, mildew, bacteria, lawn and garden pests and to protect your pets from pests such as fleas. Pesticides may also be used as insect repellants which are directly applied to the skin or clothing.

- **Pesticides in Drinking Water**
  Some pesticides that are applied to farmland or other land structures can make their way in small amounts to the ground water or surface water systems that feed drinking water supplies.

- **Worker Exposure to Pesticides**
  Pesticide applicators, vegetable and fruit pickers and others who work around pesticides can be exposed due to the nature of their jobs. To address the unique risks workers face from occupational exposure, EPA evaluates occupational exposure through a separate program. All pesticides registered by EPA have been shown to be safe when used properly.

Step Four: Risk Characterization

Risk characterization is the final step in assessing human health risks from pesticides. It is the process of combining the hazard, dose-response and exposure assessments to describe the overall risk from a pesticide. It explains the assumptions used in assessing exposure as well as the uncertainties that are built into the dose-response assessment. The strength of the overall database is considered, and broad

conclusions are made. EPA's role is to evaluate both toxicity and exposure and to determine the risk associated with use of the pesticide.

Simply put,

RISK = TOXICITY x EXPOSURE.

This means that the risk to human health from pesticide exposure depends on both the toxicity of the pesticide and the likelihood of people coming into contact with it. At least *some* exposure and *some* toxicity are required to result in a risk. For example, if the pesticide is very poisonous, but no people are exposed, there is no risk. Likewise, if there is ample exposure but the chemical is non-toxic, there is no risk. However, usually when pesticides are used, there is some toxicity and exposure, which results in a potential risk.

EPA recognizes that effects vary between animals of different species and from person to person. To account for this variability, *uncertainty factors* are built into the risk assessment. These uncertainty factors create an additional margin of safety for protecting people who may be exposed to the pesticides. FQPA requires EPA to use an extra 10-fold safety factor, if necessary, to protect infants and children from effects of the pesticide.

Types of Toxicity Tests EPA Requires for Human Health Risk Assessments

EPA evaluates studies conducted over different periods of time and that measure specific types of effects. These tests are evaluated to screen for potential health effects in infants, children and adults.

Acute Testing: Short-term exposure; a single exposure (dose).

- Oral, dermal (skin), and inhalation exposure
- Eye irritation
- Skin irritation
- Skin sensitization
- Neurotoxicity

Sub-chronic Testing: Intermediate exposure; repeated exposure over a longer period of time (i.e., 30-90 days).

- Oral, dermal (skin), and inhalation
- Neurotoxicity (nerve system damage)

Chronic Toxicity Testing: Long-term exposure; repeated exposure lasting for most of the test animal's life span. Intended to determine the effects of a pesticide after prolonged and repeated exposures.

- Chronic effects (non-cancer)
- Carcinogenicity (cancer)

Developmental and Reproductive Testing: Identify effects in the fetus of an exposed pregnant female (birth defects) and how pesticide exposure affects the ability of a test animal to successfully reproduce.

Mutagenicity Testing: Assess a pesticide's potential to affect the cell's genetic components.

Hormone Disruption: Measure effects for their potential to disrupt the endocrine system. The endocrine system consists of a set of glands and the hormones they produce that help guide the development, growth, reproduction, and behavior of animals including humans.

Risk Management

Once EPA completes the risk assessment process for a pesticide, we use this information to determine if (when used according to label directions), there is a reasonable certainty that the pesticide will not harm a person's health.

Using the conclusions of a risk assessment, EPA can then make a more informed decision regarding whether to approve a pesticide chemical or use, as proposed, or whether additional protective measures are necessary to limit occupational or non-occupational exposure to a pesticide. For example, EPA may prohibit a pesticide from being used on certain crops because consuming too much food treated with the pesticide may result in an unacceptable risk to consumers. Another example of protective measures is requiring workers to wear personal protective equipment (PPE) such as a respirator or chemical resistant gloves, or not allowing workers to enter treated crop fields until a specific period of time has passed.

If, after considering all appropriate risk reduction measures, the pesticide still does not meet EPA's safety standard, the Agency will not allow the proposed chemical or use. Regardless of the specific measures enforced, EPA's primary goal is to ensure that legal uses of the pesticide are protective of human health, especially the health of children, and the environment.

Human Health Risk Assessment and the Law

Federal law requires detailed evaluation of pesticides to protect human health and the environment. In 1996, Congress made significant changes to strengthen pesticide laws through the Food Quality Protection Act (FQPA). Many of these changes are key elements of the current risk assessment process. FQPA required that EPA consider:

- **A New Safety Standard**: FQPA strengthened the safety standard that pesticides must meet before being approved for use. EPA must ensure with a reasonable certainty that no harm will result from the legal uses of the pesticide.
- **Exposure from All Sources**: In evaluating a pesticide, EPA must estimate the combined risk from that pesticide from all non-occupational sources, such as:
  - Food Sources
  - Drinking Water Sources
  - Residential Sources
- **Cumulative Risk**: EPA is required to evaluate pesticides in light of similar toxic effects that different pesticides may share, or "a common mechanism of toxicity." At this time, EPA is developing a methodology for this type of assessment.
- **Special Sensitivity of Children to Pesticides**: EPA must ascertain whether there is an increased susceptibility from exposure to the pesticide to infants and children. EPA must build an additional 10-fold safety factor into risk assessments to ensure the protection of infants and children, unless it is determined that a lesser margin of safety will be safe for infants and children.

For More Information

If you would like more information about EPA's pesticide programs, contact the Communication Service Branch at (703) 305-5017 or visit the Pesticides Web site.

For more information on specific pesticides, or to inquire about the symptoms of pesticide poisoning, call the National Pesticide Information Center (NPIC), a toll-free hotline information at: 1-800-858-7378, or visit their Web site EXIT Disclaimer .

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Last updated on Tuesday, May 2nd, 2006
URL: http://www.epa.gov/pesticides/factsheets/riskassess.htm

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

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February 2001

ToxFAQs™ for Polychlorinated Biphenyls (PCBs)

(Bifenilos Policlorados (BPCs))

This fact sheet answers the most frequently asked health questions about polychlorinated biphenyls (PCBs). For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls (PCBs)?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors,

Contact Information

RELATED RESOURCES

ToxFAQ™ 35k

ToxFAQ™ en Español 32k

Public Health Statement 125k

Public Health Statement en Español 321k

Toxicological Profile 13.6MB

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Priority List of Hazardous Substances

Division of Toxicology

and old microscope and hydraulic oils.

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What happens to polychlorinated biphenyls (PCBs) when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

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How might I be exposed to polychlorinated biphenyls (PCBs)?

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

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How can polychlorinated biphenyls (PCBs) affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

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How likely are polychlorinated biphenyls (PCBs) to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

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How do polychlorinated biphenyls (PCBs) affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

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How can families reduce the risk of exposure to polychlorinated biphenyls (PCBs)?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.
- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

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Is there a medical test to show whether I've been exposed to polychlorinated biphenyls (PCBs)?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

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Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

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References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333
Phone: 1-888-42-ATSDR (1-888-422-8737)
FAX: (770)-488-4178
Email: ATSDRIC@cdc.gov

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ATSDR Department of Health and Human Services
Agency for Toxic Substances & Disease Registry

2007 CERCLA Priority List of Hazardous Substances

2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
1	ARSENIC	1672.58	1	007440-38-2
2	LEAD	1534.07	2	007439-92-1
3	MERCURY	1504.69	3	007439-97-6
4	VINYL CHLORIDE	1387.75	4	000075-01-4
5	POLYCHLORINATED BIPHENYLS	1365.78	5	001336-36-3
6	BENZENE	1355.96	6	000071-43-2
7	CADMIUM	1324.22	8	007440-43-9
8	POLYCYCLIC AROMATIC HYDROCARBONS	1316.98	7	130498-29-2
9	BENZO(A)PYRENE	1312.45	9	000050-32-8
10	BENZO(B)FLUORANTHENE	1266.55	10	000205-99-2
11	CHLOROFORM	1223.03	11	000067-66-3
12	DDT, P,P'-	1193.36	12	000050-29-3
13	AROCLOR 1254	1182.63	13	011097-69-1
14	AROCLOR 1260	1177.77	14	011096-82-5
15	DIBENZO(A,H)ANTHRACENE	1165.88	15	000053-70-3
16	TRICHLOROETHYLENE	1154.73	16	000079-01-6
17	DIELDRIN	1150.91	17	000060-57-1
18	CHROMIUM, HEXAVALENT	1149.98	18	018540-29-9
19	PHOSPHORUS, WHITE	1144.77	19	007723-14-0
20	CHLORDANE	1133.21	21	000057-74-9
21	DDE, P,P'-	1132.49	20	000072-55-9
22	HEXACHLOROBUTADIENE	1129.63	22	000087-68-3
23	COAL TAR CREOSOTE	1124.32	23	008001-58-9
24	ALDRIN	1117.22	25	000309-00-2
25	DDD, P,P'-	1114.83	24	000072-54-8
26	BENZIDINE	1114.24	26	000092-87-5
27	AROCLOR 1248	1112.20	27	012672-29-6
28	CYANIDE	1099.48	28	000057-12-5
29	AROCLOR 1242	1093.14	29	053469-21-9
30	AROCLOR	1091.52	62	012767-79-2
31	TOXAPHENE	1086.65	30	008001-35-2
32	HEXACHLOROCYCLOHEXANE, GAMMA-	1081.63	32	000058-89-9
33	TETRACHLOROETHYLENE	1080.43	31	000127-18-4
34	HEPTACHLOR	1072.67	33	000076-44-8
35	1,2-DIBROMOETHANE	1064.06	34	000106-93-4
36	HEXACHLOROCYCLOHEXANE, BETA-	1060.22	37	000319-85-7
37	ACROLEIN	1059.07	36	000107-02-8
38	DISULFOTON	1058.85	35	000298-04-4
39	BENZO(A)ANTHRACENE	1057.96	38	000056-55-3
40	3,3'-DICHLOROBENZIDINE	1051.61	39	000091-94-1

41	ENDRIN	1048.57	41	000072-20-8
42	BERYLLIUM	1046.12	40	007440-41-7
43	HEXACHLOROCYCLOHEXANE, DELTA-	1038.27	42	000319-86-8
44	1,2-DIBROMO-3-CHLOROPROPANE	1035.55	43	000096-12-8
45	PENTACHLOROPHENOL	1028.01	45	000087-86-5
46	HEPTACHLOR EPOXIDE	1027.12	44	001024-57-3
47	CARBON TETRACHLORIDE	1023.32	46	000056-23-5
48	AROCLOR 1221	1018.41	47	011104-28-2
49	COBALT	1015.57	50	007440-48-4
50	DDT, O,P'-	1014.71	49	000789-02-6
51	AROCLOR 1016	1014.33	48	012674-11-2
52	DI-N-BUTYL PHTHALATE	1007.49	52	000084-74-2
53	NICKEL	1005.40	55	007440-02-0
54	ENDOSULFAN	1004.65	54	000115-29-7
55	ENDOSULFAN SULFATE	1003.56	53	001031-07-8
56	DIAZINON	1002.08	57	000333-41-5
57	ENDOSULFAN, ALPHA	1001.30	58	000959-98-8
58	XYLENES, TOTAL	996.07	59	001330-20-7
59	CIS-CHLORDANE	995.08	51	005103-71-9
60	DIBROMOCHLOROPROPANE	994.87	60	067708-83-2
61	METHOXYCHLOR	994.47	61	000072-43-5
62	BENZO(K)FLUORANTHENE	981.26	63	000207-08-9
63	ENDRIN KETONE	978.99	64	053494-70-5
64	TRANS-CHLORDANE	973.99	56	005103-74-2
65	CHROMIUM(VI) OXIDE	969.58	66	001333-82-0
66	METHANE	959.78	67	000074-82-8
67	ENDOSULFAN, BETA	959.19	65	033213-65-9
68	AROCLOR 1232	955.64	68	011141-16-5
69	ENDRIN ALDEHYDE	954.86	69	007421-93-4
70	BENZOFLUORANTHENE	951.48	70	056832-73-6
71	TOLUENE	947.50	71	000108-88-3
72	2-HEXANONE	942.02	72	000591-78-6
73	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	938.11	73	001746-01-6
74	ZINC	932.89	74	007440-66-6
75	DIMETHYLARSINIC ACID	922.06	75	000075-60-5
76	DI(2-ETHYLHEXYL)PHTHALATE	919.02	76	000117-81-7
77	CHROMIUM	908.52	77	007440-47-3
78	NAPHTHALENE	896.67	78	000091-20-3
79	1,1-DICHLOROETHENE	891.19	79	000075-35-4
80	METHYLENE CHLORIDE	888.96	81	000075-09-2
81	AROCLOR 1240	888.11	80	071328-89-7
82	2,4,6-TRINITROTOLUENE	883.59	82	000118-96-7
83	BROMODICHLOROETHANE	870.00	83	000683-53-4
84	HYDRAZINE	864.41	85	000302-01-2
85	1,2-DICHLOROETHANE	863.99	84	000107-06-2
86	2,4,6-TRICHLOROPHENOL	863.71	86	000088-06-2
87	2,4-DINITROPHENOL	860.45	87	000051-28-5
88	BIS(2-CHLOROETHYL) ETHER	859.88	88	000111-44-4
89	THIOCYANATE	849.21	89	000302-04-5
90	ASBESTOS	841.54	90	001332-21-4
91	CHLORINE	840.37	92	007782-50-5
92	CYCLOTRIMETHYLENETRINITRAMINE (RDX)	840.28	91	000121-82-4
93	HEXACHLOROBENZENE	838.34	93	000118-74-1

94	2,4-DINITROTOLUENE	837.88	96	000121-14-2
95	RADIUM-226	835.93	94	013982-63-3
96	ETHION	834.03	97	000563-12-2
97	1,1,1-TRICHLOROETHANE	833.81	95	000071-55-6
98	URANIUM	833.41	98	007440-61-1
99	ETHYLBENZENE	832.13	99	000100-41-4
100	RADIUM	828.07	100	007440-14-4
101	THORIUM	825.17	101	007440-29-1
102	4,6-DINITRO-O-CRESOL	822.78	102	000534-52-1
103	1,3,5-TRINITROBENZENE	820.17	103	000099-35-4
104	CHLOROBENZENE	819.69	105	000108-90-7
105	RADON	817.89	104	010043-92-2
106	RADIUM-228	816.76	106	015262-20-1
107	THORIUM-230	814.72	107	014269-63-7
107	URANIUM-235	814.72	107	015117-96-1
109	BARIUM	813.46	109	007440-39-3
110	FLUORANTHENE	812.40	113	000206-44-0
111	URANIUM-234	812.11	110	013966-29-5
112	N-NITROSODI-N-PROPYLAMINE	811.05	111	000621-64-7
113	THORIUM-228	810.36	112	014274-82-9
114	RADON-222	809.78	114	014859-67-7
115	HEXACHLOROCYCLOHEXANE, ALPHA-	809.56	116	000319-84-6
116	1,2,3-TRICHLOROBENZENE	808.41	143	000087-61-6
117	MANGANESE	807.90	115	007439-96-5
118	COAL TARS	807.07	117	008007-45-2
119	CHRYSOTILE ASBESTOS	806.68	119	012001-29-5
119	STRONTIUM-90	806.68	119	010098-97-2
121	PLUTONIUM-239	806.67	118	015117-48-3
122	POLONIUM-210	806.39	122	013981-52-7
123	METHYLMERCURY	806.39	121	022967-92-6
124	PLUTONIUM-238	806.01	123	013981-16-3
125	LEAD-210	805.90	124	014255-04-0
126	PLUTONIUM	805.23	125	007440-07-5
127	CHLORPYRIFOS	804.93	125	002921-88-2
128	COPPER	804.86	133	007440-50-8
129	AMERICIUM-241	804.55	128	086954-36-1
130	RADON-220	804.54	127	022481-48-7
131	AMOSITE ASBESTOS	804.07	129	012172-73-5
132	IODINE-131	803.48	130	010043-66-0
133	HYDROGEN CYANIDE	803.08	132	000074-90-8
134	TRIBUTYLTIN	802.61	131	000688-73-3
135	GUTHION	802.32	134	000086-50-0
136	NEPTUNIUM-237	802.13	135	013994-20-2
137	CHRYSENE	802.10	139	000218-01-9
138	CHLORDECONE	801.64	136	000143-50-0
138	IODINE-129	801.64	136	015046-84-1
138	PLUTONIUM-240	801.64	136	014119-33-6
141	S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	797.88	140	000078-48-8
142	BROMINE	789.15	142	007726-95-6
143	POLYBROMINATED BIPHENYLS	789.11	141	067774-32-7
144	DICOFOL	787.56	144	000115-32-2
145	PARATHION	784.14	145	000056-38-2
146	1,1,2,2-TETRACHLOROETHANE	782.15	146	000079-34-5

147	SELENIUM	778.98	147	007782-49-2	
148	HEXACHLOROCYCLOHEXANE, TECHNICAL GRADE	774.91	148	000608-73-1	
149	TRICHLOROFLUOROETHANE	770.74	149	027154-33-2	
150	TRIFLURALIN	770.12	150	001582-09-8	
151	DDD, O,P'-	768.73	151	000053-19-0	
152	4,4'-METHYLENEBIS(2-CHLOROANILINE)	766.66	152	000101-14-4	
153	HEXACHLORODIBENZO-P-DIOXIN	760.42	153	034465-46-8	
154	HEPTACHLORODIBENZO-P-DIOXIN	754.47	154	037871-00-4	
155	PENTACHLOROBENZENE	753.58	155	000608-93-5	
156	1,3-BUTADIENE	747.31	201	000106-99-0	
157	AMMONIA	745.55	156	007664-41-7	
158	2-METHYLNAPHTHALENE	743.24	157	000091-57-6	
159	1,4-DICHLOROBENZENE	737.32	159	000106-46-7	
160	1,1-DICHLOROETHANE	736.23	158	000075-34-3	
161	ACENAPHTHENE	731.25	160	000083-32-9	
162	1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN	726.14	161	039001-02-0	
163	1,1,2-TRICHLOROETHANE	724.96	162	000079-00-5	
164	TRICHLOROETHANE	723.32	163	025323-89-1	
165	HEXACHLOROCYCLOPENTADIENE	719.01	164	000077-47-4	
166	HEPTACHLORODIBENZOFURAN	718.58	165	038998-75-3	
167	1,2-DIPHENYLHYDRAZINE	713.90	166	000122-66-7	
168	2,3,4,7,8-PENTACHLORODIBENZOFURAN	710.71	167	057117-31-4	
169	TETRACHLOROBIPHENYL	709.21	168	026914-33-0	
170	CRESOL, PARA-	707.83	169	000106-44-5	
171	OXYCHLORDANE	706.32	170	027304-13-8	
172	1,2-DICHLOROBENZENE	704.91	171	000095-50-1	
173	1,2-DICHLOROETHENE, TRANS-	704.04	178	000156-60-5	
174	INDENO(1,2,3-CD)PYRENE	703.30	180	000193-39-5	
175	GAMMA-CHLORDENE	702.59	172	056641-38-4	
176	CARBON DISULFIDE	702.55	174	000075-15-0	
177	TETRACHLOROPHENOL	702.54	173	025167-83-3	
178	AMERICIUM	701.62	175	007440-35-9	
178	URANIUM-233	701.62	175	013968-55-3	
180	PALLADIUM	700.66	177	007440-05-3	
181	HEXACHLORODIBENZOFURAN	700.56	179	055684-94-1	
182	PHENOL	696.96	183	000108-95-2	
183	CHLOROETHANE	693.90	182	000075-00-3	
184	ACETONE	693.31	181	000067-64-1	
185	P-XYLENE	690.20	185	000106-42-3	
186	DIBENZOFURAN	689.19	187	000132-64-9	
187	ALUMINUM	688.13	186	007429-90-5	
188	2,4-DIMETHYLPHENOL	685.76	189	000105-67-9	
189	CARBON MONOXIDE	684.49	188	000630-08-0	
190	TETRACHLOROETHANE	677.97	190	025322-20-7	
191	HYDROGEN SULFIDE	676.51	193	007783-06-4	
192	PENTACHLORODIBENZOFURAN	673.21	192	030402-15-4	
193	CHLOROMETHANE	670.19	191	000074-87-3	
194	BIS(2-METHOXYETHYL) PHTHALATE	666.08	194	034006-76-3	
195	BUTYL BENZYL PHTHALATE	659.38	195	000085-68-7	
196	CRESOL, ORTHO-	658.66	196	000095-48-7	
197	HEXACHLOROETHANE	653.10	199	000067-72-1	
198	VANADIUM	651.70	198	007440-62-2	

199	N-NITROSODIMETHYLAMINE	650.71	200	000062-75-9
200	1,2,4-TRICHLOROBENZENE	647.30	203	000120-82-1
201	BROMOFORM	643.53	202	000075-25-2
202	TETRACHLORODIBENZO-P-DIOXIN	635.74	204	041903-57-5
203	1,3-DICHLOROBENZENE	631.41	205	000541-73-1
204	PENTACHLORODIBENZO-P-DIOXIN	625.12	207	036088-22-9
205	N-NITROSODIPHENYLAMINE	624.79	208	000086-30-6
206	1,2-DICHLOROETHYLENE	622.49	206	000540-59-0
207	2,3,7,8-TETRACHLORODIBENZOFURAN	622.15	210	051207-31-9
208	2-BUTANONE	620.01	209	000078-93-3
209	2,4-DICHLOROPHENOL	616.45	212	000120-83-2
210	1,4-DIOXANE	616.29	215	000123-91-1
211	FLUORINE	613.28	214	007782-41-4
212	NITRITE	612.64	216	014797-65-0
213	CESIUM-137	612.50	217	010045-97-3
214	SILVER	612.19	213	007440-22-4
215	CHROMIUM TRIOXIDE	610.85	218	007738-94-5
216	NITRATE	610.66	219	014797-55-8
217	POTASSIUM-40	608.91	220	013966-00-2
218	DINITROTOLUENE	607.65	221	025321-14-6
219	ANTIMONY	605.37	222	007440-36-0
220	COAL TAR PITCH	605.33	224	065996-93-2
221	THORIUM-227	605.32	223	015623-47-9
222	2,4,5-TRICHLOROPHENOL	604.83	225	000095-95-4
223	ARSENIC ACID	604.45	226	007778-39-4
224	ARSENIC TRIOXIDE	604.36	227	001327-53-3
225	PHORATE	603.10	228	000298-02-2
226	BENZOPYRENE	603.00	230	073467-76-2
227	CRESOLS	602.74	229	001319-77-3
228	CHLORDANE, TECHNICAL	602.62	231	012789-03-6
229	DIMETHOATE	602.61	232	000060-51-5
230	ACTINIUM-227	602.57	233	014952-40-0
230	STROBANE	602.57	233	008001-50-1
232	4-AMINOBIPHENYL	602.51	235	000092-67-1
232	PYRETHRUM	602.51	235	008003-34-7
234	ARSINE	602.42	237	007784-42-1
235	NALED	602.32	238	000300-76-5
236	DIBENZOFURANS, CHLORINATED	602.13	239	042934-53-2
236	ETHOPROP	602.13	239	013194-48-4
238	ALPHA-CHLORDENE	601.94	241	056534-02-2
238	CARBOPHENOTHION	601.94	241	000786-19-6
240	DICHLORVOS	601.64	243	000062-73-7
241	CALCIUM ARSENATE	601.45	244	007778-44-1
241	MERCURIC CHLORIDE	601.45	244	007487-94-7
241	SODIUM ARSENITE	601.45	244	007784-46-5
244	FORMALDEHYDE	599.64	247	000050-00-0
245	2-CHLOROPHENOL	599.62	248	000095-57-8
246	PHENANTHRENE	597.68	249	000085-01-8
247	HYDROGEN FLUORIDE	588.03	250	007664-39-3
248	2,4-D ACID	584.47	251	000094-75-7
249	DIBROMOCHLOROMETHANE	580.59	252	000124-48-1
250	DIURON	579.16	253	000330-54-1
251	BUTYLATE	578.43	254	002008-41-5

252	DIMETHYL FORMAMIDE	578.23	255	000068-12-2
253	PYRENE	577.95	256	000129-00-0
254	DICHLOROBENZENE	577.70	211	025321-22-6
255	ETHYL ETHER	572.47	257	000060-29-7
256	DICHLOROETHANE	570.46	258	001300-21-6
257	4-NITROPHENOL	567.79	259	000100-02-7
258	1,3-DICHLOROPROPENE, CIS-	561.82	184	010061-01-5
259	PHOSPHINE	559.74	260	007803-51-2
260	TRICHLOROBENZENE	557.96	261	012002-48-1
261	2,6-DINITROTOLUENE	555.20	262	000606-20-2
262	FLUORIDE ION	549.64	263	016984-48-8
263	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	547.90	264	035822-46-9
264	METHYL PARATHION	545.83	265	000298-00-0
265	PENTAERYTHRITOL TETRANITRATE	545.59	266	000078-11-5
266	1,3-DICHLOROPROPENE, TRANS-	543.37	267	010061-02-6
267	BIS(2-ETHYLHEXYL)ADIPATE	540.20	268	000103-23-1
268	CARBAZOLE	534.52	269	000086-74-8
269	METHYL ISOBUTYL KETONE	533.24	271	000108-10-1
270	1,2-DICHLOROETHENE, CIS-	533.15	270	000156-59-2
271	STYRENE	532.70	272	000100-42-5
272	CARBARYL	530.98	273	000063-25-2
273	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	529.45	274	067562-39-4
274	ACRYLONITRILE	528.28	275	000107-13-1
275	1-METHYLNAPHTHALENE	526.51	NEW	

Substances were assigned the same rank when two (or more) substances received equivalent total point scores.

CAS #= Chemical Abstracts Service Registry Number

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