

## 講演会「設備技術者のあるべき姿 ～海外と日本の相違～」

主催 社団法人建築設備技術者協会 中部支部  
共催 社団法人空気調和衛生工学会 中部支部  
会場 東桜会館(名古屋市東区東桜2-6-30 )  
日時 平成21年4月14日(火) 15:00～17:00  
講師 松原 茂(米国プロフェッショナルエンジニア)

司会、進行役 馬瀬(中部支部)

15:00～ 開演挨拶 志賀支部長

15:10～ 講師紹介 吉見 明博(四日市電機㈱副社長)

講演 松原 茂様

16:30～ 質疑、意見交換

16:55～ 閉会挨拶

### 講師略歴

千代田化工建設、USA法人ビーコンエンジニアに所属。米国、カナダ、サウジ等長年の海外勤務を経て、2009年より本拠地を日本に移す。

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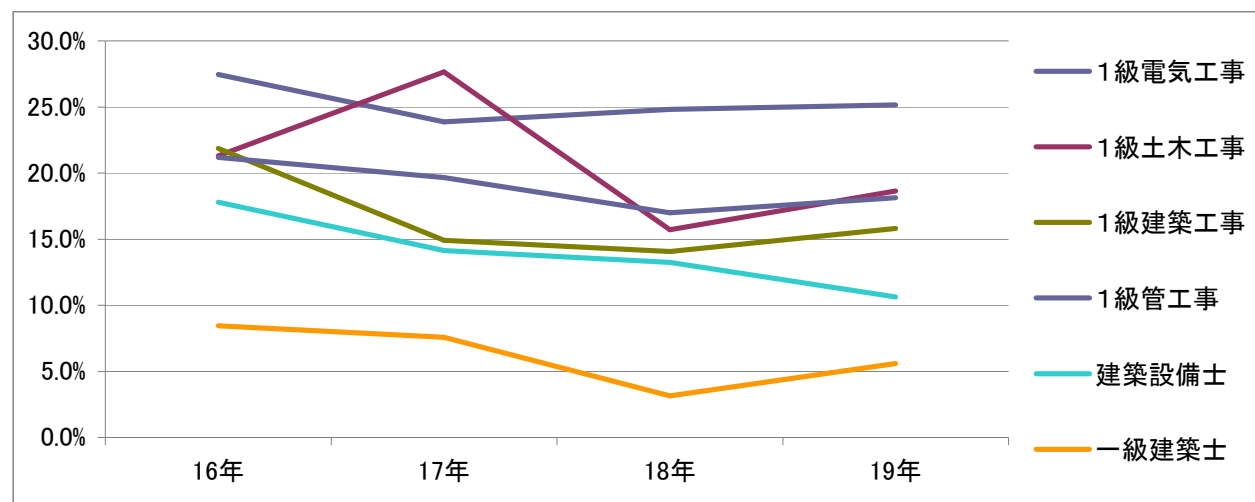
## 建設関連技術者資格

国土交通省	大臣官房	建設研修センター	1級土木工事	1級管工事
	住宅局	建築技術教育普及センター	一級建築士	建築設備士
	総合政策局	建設業振興基金	1級建築工事	1級電気工事

設計		土木系	建築系	設備系	電気系
		講習	一級建築士		
		開発行為	確認申請	建築士法で意見を述べる立場	
	試験管轄	総合政策局	住宅局	住宅局	
		住宅建設産業協会	建築技術教育普及センター	建築技術教育普及センター	
		国土交通省推薦	国土交通省推薦	国土交通省推薦	
	経験年数	指定学科卒2年	指定学科卒2年	指定学科卒2年	
	受験料		15,100	34,650	
施工管理技術者		1級土木工事	1級建築工事	1級管工事	1級電気工事
	試験管轄	大臣官房	総合政策局	大臣官房	総合政策局
		建設研修センター	建設業振興基金	建設研修センター	建設業振興基金
	合格率	国土交通省推薦	国土交通省推薦	国土交通省推薦	国土交通省推薦
	受験料	16,400	18,800	17,000	23,600
保安監督者					主任技術者
					講習
	管轄				経済産業省

合格者(1次x2次)

	19年合格者	16年	17年	18年	19年
1級電気工事	5,856	27.5%	23.9%	24.8%	25.1%
1級土木工事	12,899	21.3%	27.7%	15.7%	18.6%
1級建築工事	6,212	21.9%	14.9%	14.1%	15.8%
1級管工事	4,580	21.2%	19.7%	17.0%	18.1%
建築設備士	450	17.8%	14.1%	13.2%	10.6%
一級建築士	3,705	8.4%	7.6%	3.1%	5.6%



### 一級建築士

住宅局管轄、建築士法で身分が守られている。  
確認申請業務で設計者とは一級建築士のこと。

### 建築設備士

建築士法に定める資格。確認申請において設計者が設備に関して意見を聞いた場合に名前を記載する。  
実務の報酬料は設備の設計も建築士の業務に含まれていることから、建築士法 告示1206号 建築事務所の報酬基準を適用できる。

## USAの例

技術者の資格Licenseを扱うのは州の部署 (Department Of License), Consumer Affairs。  
産業側の論理でなく消費者の利益のために資格はある。

学校卒業後Fundamentals of Engineering (EIT=Engineers in Training) のLicenseを取得。

実務経験4年程度でPrinciples (Professional ) Engineerの受験資格。人格も重要で推薦者が必要。  
 2年ごとに更新。

技術、経験、人格を持つP. Eが選任される。

建築に関わる機械、電気の設計にはProfessional Engineer の作成した図面が必要。

P.Eが表に出て責任を持つ。

申請の審査には同業他社にコメントを求める。コストは施主の負担。

高い技術レベルのチェックが可能。

公共建築物の場合設計事務所の選定は提案型で内容の判定はコンペに参加していない同業者の  
 意見を聞いて判定をする。審査の内容はオープン。役所の部署は資格を有していないので主導しない。

	Total	Pass	% Pass
Fundamentals of Engineering (EIT)	339	313	92%
Principles & Practice of Engineering			
Architectural	3	1	33%
Chemical	3	3	100%
Civil	155	86	55%
Control Systems	9	8	89%
Electrical	34	16	47%
Environmental	10	8	80%
Fire Protection	7	5	71%
Mechanical	43	21	49%
Mining/Mineral	1	0	0%
Nuclear	1	1	100%
Structural II	40	19	48%
Structural III	107	24	22%
Fundamentals of Land Surveying (LSIT)	31	18	58%
Principles & Practice of Land Surveying			
NCEES – 6 Hour	30	24	80%
WA Specific L S (2-hour)	59	20	34%
On-Site Designer	9	1	11%
On-Site Inspector	9	3	22%



# BOARD FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS



This Is To Certify That Pursuant  
To The Provisions of Chapter 7, Division 3 of The Business and Professions Code

~~Spencer A. [illegible]~~

IS DULY LICENSED AS A  
PROFESSIONAL ENGINEER  
IN  
ELECTRICAL ENGINEERING

In The State of California, and Is Entitled To All The Rights and  
Privileges Conferred In Said Code



WITNESS OUR HAND AND SEAL

Certificate No E 16328

This 20th day of October, 2000, at Sacramento, California.

BOARD FOR PROFESSIONAL  
ENGINEERS AND LAND SURVEYORS

~~Spencer A. [illegible]~~



State Board of Registration for  
Professional Engineers & Land Surveyors

*This is to certify that*

~~Spencer A. [illegible]~~

*having given satisfactory evidence of the necessary qualifications as required  
by the laws of the State of Georgia has been duly registered as a*

**Professional Engineer**

*in the State of Georgia*

*Charles H. Armour*  
CHAIRMAN

THIS 1st DAY OF September 19 98

*Will G. Nelly*

JOINT SECRETARY STATE EXAMINING BOARDS



REGISTRATION NO 24761

# The Washington Board

*Informing Professional  
Engineers and Professional  
Land Surveyors of the events  
and developments that affect  
their professions*



# Journal

Number 41 • Spring 2008

## YOUR BOARD MEMBERS

**Daniel Parker, PE, Chair,**  
**Journal Editor**  
**Auburn**

**Mel Garland, PLS, Vice Chair**  
**Covington**

**Ying Fay Chan, PE**  
**Olympia**

**Chun Lau, PE**  
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**Neil Norman, PE**  
**Richland**

**Lisa Brown, PE**  
**Spokane**

**Scott Valentine, PLS**  
**Spokane**

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**George A. Twiss, PLS**  
**Executive Director, Tacoma**

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*Administrative services are provided to the Board by the Department of Licensing. The Department and the Board have a policy of providing equal access to their services. If you need special accommodation, please call (360) 664-1575 or TTY (360) 664-8885.*





be competent and make their work conform to accepted surveying standards. Should I file a complaint?

**Answer:**

*Whether you wish to file a complaint is up to you. However, on a more serious note is how your coworkers are viewing this policy. Careless and/or defiant treatment of the conditions of the policy WILL place the particular licensee at risk of disciplinary action. Additionally, engineering designs by the agency could contain or be based upon erroneous data that could cause harm to the public.*

**Question:**

I work in the Spokane area and sometimes practice in northern Idaho. I am licensed in civil in both Washington and Idaho. The work I do is mostly for residential customers like: home remodeling, site grading, retaining walls, lake front improvements etc. When practicing in Idaho I encounter a fair amount of this type of work done by individuals licensed in Geological Engineering. What is this branch and why is it not offered in Washington?

**Answer:**

*The branch of Geological Engineering is a rather specialized regional branch supported by an examination originating in Arizona. At present, only a few states offer this branch – Arizona, Idaho and Colorado, to name a few. The exam is prepared under sound psychometric processes and is supported by Subject Matter Experts in the development and grading of the exam. Approximate statistics are that as few as 5 to 7 total candidates take the exam at any one administration. The Washington Board has studied this exam but has concluded that there is insufficient justification to implement the administration of the exam and a new branch designation.*

# Examinations

## OCTOBER 2007 Examination Results

	Total	Pass	% Pass
Fundamentals of Engineering (EIT)	339	313	92%
Principles & Practice of Engineering			
Architectural	3	1	33%
Chemical	3	3	100%
Civil	155	86	55%
Control Systems	9	8	89%
Electrical	34	16	47%
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Principles & Practice of Land Surveying			
NCEES – 6 Hour	30	24	80%
WA Specific L S (2-hour)	59	20	34%
On-Site Designer	9	1	11%
On-Site Inspector	9	3	22%

# Investigations & Enforcement

## Statistics of Actions Taken By The Board

### JULY 1, 2007 THROUGH DECEMBER 31, 2007

Active investigations as of July 1, 2007	66
Investigations Opened	27
Investigations Closed	41
Active Investigations as of December 31, 2007	52

### SUMMARY BY MONTH:

	Complaints Received	Inquiries Received	Investigations Opened*
July	5	1	9
August	20	1	8
September	8	2	3
October	11	5	3
November	2	2	2
December	13	4	2
<b>Totals</b>	<b>59</b>	<b>15</b>	<b>27</b>

\*Investigations can be opened by either a complaint or an inquiry received.

### SUMMARY BY PROFESSION AS OF DECEMBER 31, 2007

	Active Investigations	Legal Status	Compliance Orders
Prof. Engineers	5	19	5
Prof. Land Surveyors	5	3	6
Unlic. Engineers	3	1	1
Unlic. Land Surveyors	2	4	1
On-site Designers	5	6	4
<b>Totals</b>	<b>20</b>	<b>33</b>	<b>17</b>

*Legal status refers to the investigations that the Case Manager has referred for adjudicative action.*

## Summaries Of Investigations And Actions By The Board

The following case summaries cover the disciplinary actions against licensees from July 1, 2007 to December 31, 2007. In each disposition the Board accepted the recommendations of the case manager, unless stated otherwise. For those cases involving a Board order, each licensee may be monitored for compliance with the conditions imposed in the order.

The summary information provided under "INFORMAL ACTIONS" is provided to educate licensees on events and circumstances that come before the Board for investigation. In those cases no disciplinary action is taken because either the allegations are unsubstantiated, fall outside the scope of jurisdiction of the Board or it becomes unnecessary because of corrective measures taken. Any investigations that reveal clear and convincing evidence of wrongdoing, and where a Board Order is issued, will be listed under "FORMAL ACTIONS".

The decisions of the Board members who work as Case Managers of the investigations are based upon their personal opinions of the severity of the infraction and the best course of action to take to appropriately resolve issues. Interpreting any one or several dispositions as indicative of the Board's view of how all such cases will be handled in the future would be incorrect.

These summaries are not intended to disclose complete details related to any given investigation or action. While every effort is made to ensure accuracy of the information shown, anyone intending to make a decision based upon this information should contact Robert Fuller, Deputy Executive Director at (360) 664-1578 for more details.

### Formal Actions

#### ENGINEERING

##### Jason Dao, Case No. 07-06-0004

The Board's investigation of Mr. Dao was based upon a complaint alleging that Mr. Dao copied answers from another candidate during the Fundamentals of Engineering Examination that he took in April, 2007.

During the investigation Mr. Dao admitted to copying answers from the candidate that was seated in front of him during the examination. It was also found that

国際的な規格

ASTM     DIM     ISO

ケーブルサイズ

IEC/EN規格AWG表示			IEC/EN規格ISOメートル表示		JIS規格ISOメートル表示	
AWGサイズ	等価断面積	通電電流	標準サイズ	通電電流	標準サイズ	通電電流
24	0.21 (mm <sup>2</sup> )	4 (A)	-0.20 (mm <sup>2</sup> )	4 (A)	-	-
22	0.32	6	-0.34	5	-	-
20	0.52	8	0.5	6	0.50 (mm <sup>2</sup> )	7 (A)
18	0.82	10	0.75	9	0.75	11
16	1.3	16	1	13.5	1.25	16
14	2.1	22	1.5	17.5		
12	3.3	29	2.5	24	2	21
10	5.3	38	4	32	3.5	30
8	8.4	50	6	41	5.5	40
6	13.3	67	10	57	8	50
4	21.2	90	16	76	14	70
2	33.6	121	25	101	22	94
1	42.4	139	35	125	38	132
1/0	53.5	162	50	150	60	175
2/0	67.4	185	70	192		
3/0	85	217	95	232	100	240
4/0	107	242	120	269		
250	127	271	150	309	150	310
300	152	309	185	353	200	370
350	177	353	240	415	250	430
400	202					
500	253	415	300	520	325	520
600	304	520	-	-	-	-

アメリカのAWG (American Wire Gauge、別名Brown and Sharpe's Gauge)、イギリスのSWG (Standard Wire Gauge) などがある。たとえばAWGナンバー10は直径2.588ミリメートルであり、SWGナンバー10は直径3.251ミリメートル。

塩ビ管のサイズ

PVC		ASTM D2241		VU		VP	
SIZE		11Bar	21.7Bar				
inch	O. Dmm	Thickness		O. Dmm	Thickness	O. Dmm	Thickness
1/2	21.336		1.6			22	3.0
3/4	26.67		2.0			26	3.0
1	334.01	1.5	2.5			32	3.5
1. 1/4	42.168	1.6	3.1			38	3.5
1. 1/2	48.26	1.9	3.6	48	1.8	48	4.0
2	60.325	2.3	5.5	60	1.8	60	4.5
2. 1/2	88.9	3.4	6.6	76	2.2	76	4.5
3	114.3	4.4	8.5	89	2.7	89	5.9
4	168.275	6.5	12.5	114	3.1	114	7.1
5	219.075	8.4		140	4.1	140	7.5
6				165	5.1	165	9.6
8				216	6.5	216	11.0



only a specific load, such as a water heater, shall be permitted to be locked or sealed where located so as to be accessible.

### 230.94 Relative Location of Overcurrent Device and Other Service Equipment.

The overcurrent device shall protect all circuits and devices.

*Exception No. 1: The service switch shall be permitted on the supply side.*

*Exception No. 2: High-impedance shunt circuits, surge arresters, surge-protective capacitors, and instrument transformers (current and voltage) shall be permitted to be connected and installed on the supply side of the service disconnecting means as permitted in 230.82.*

*Exception No. 3: Circuits for load management devices shall be permitted to be connected on the supply side of the service overcurrent device where separately provided with overcurrent protection.*

*Exception No. 4: Circuits used only for the operation of fire alarm, other protective signaling systems, or the supply to fire pump equipment shall be permitted to be connected on the supply side of the service overcurrent device where separately provided with overcurrent protection.*

*Exception No. 5: Meters nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250.*

*Exception No. 6: Where service equipment is power operable, the control circuit shall be permitted to be connected ahead of the service equipment if suitable overcurrent protection and disconnecting means are provided.*

### 230.95 Ground-Fault Protection of Equipment.

Ground-fault protection of equipment shall be provided for solidly grounded wye electrical services of more than 150 volts to ground but not exceeding 600 volts phase-to-phase for each service disconnect rated 1000 amperes or more.

The rating of the service disconnect shall be considered to be the rating of the largest fuse that can be installed or the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted.

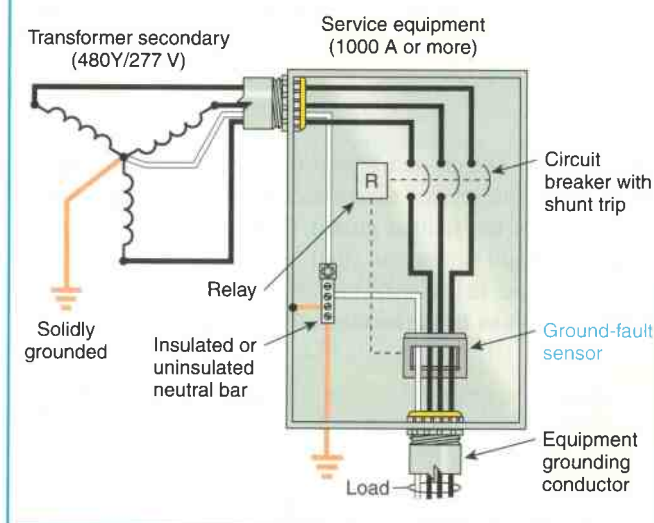
See the definition of *ground-fault protection of equipment* in Article 100. Ground-fault protection of equipment on services rated 1000 amperes or more operating at 480Y/277 volts was first required in the 1971 Code because of the unusually high number of burndowns reported on those types of service. Ground-fault protection of services does not protect the conductors on the supply side of the service disconnecting means, but it is designed to provide protection from line-to-ground faults that occur on the load side of the service

disconnecting means. An alternative to installing ground-fault protection may be to provide multiple disconnects rated less than 1000 amperes. For instance, up to six 800-ampere disconnecting means may be used, and, in that case, ground-fault protection would not be required. Fine Print Note No. 2 to 230.95(C) recognizes that ground-fault protection may be desirable at lesser amperages on solidly grounded systems for voltages exceeding 150 volts to ground but not exceeding 600 volts phase to phase.

In addition to providing ground-fault protection, engineering studies are recommended to determine the circuit impedance and short-circuit currents that would be available at the supply terminals, so that equipment and overcurrent protection of the proper interrupting rating are used. See 110.9 and 110.10 for details on interrupting rating and circuit impedance.

The two basic types of ground-fault equipment protectors are illustrated in Exhibits 230.28 and 230.29. In Exhibit 230.28, the ground-fault sensor is installed around all the circuit conductors, and a stray current on a line-to-ground fault sets up an unbalance of the currents flowing in individual conductors installed through the ground-fault sensor. When this current exceeds the setting of the ground-fault sensor, the shunt trip operates and opens the circuit breakers.

The ground-fault sensor illustrated in Exhibit 230.29 is installed around the bonding jumper only. When an unbalanced current from a line-to-ground fault occurs, the current flows through the bonding jumper and the shunt trip causes the circuit breaker to operate, removing the load from the line. See also 250.24(A)(4), which permits a grounding electrode conductor connection to the equipment grounding terminal bar or bus.



**Exhibit 230.28** A ground-fault sensor encircling all circuit conductors, including the neutral.

multiwire, as well as 210.4(C) and its two exceptions. Multiwire branch circuits are permitted to supply line-to-line loads that consist of one piece of utilization equipment or where all ungrounded conductors are opened simultaneously by the branch-circuit overcurrent device. See the commentary following 210.4(C) for additional information.

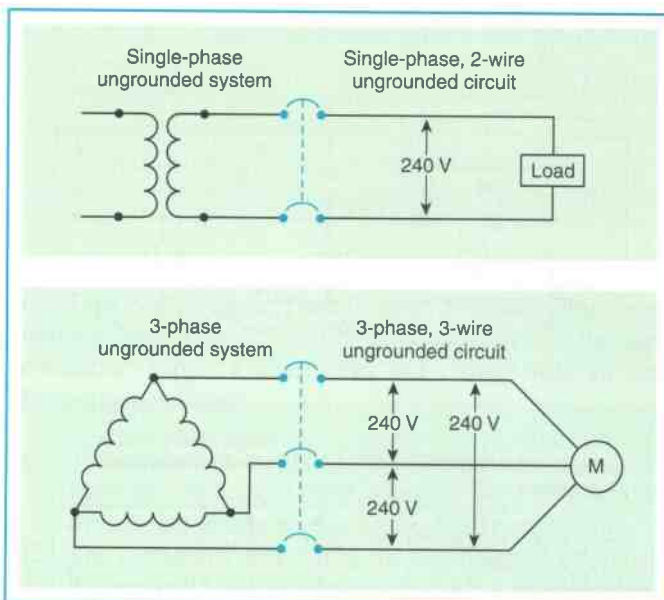
Section 240.20(B) requires that if a circuit breaker is used, it must open all ungrounded conductors of the circuit when it trips or is manually operated. For 2-wire circuits with one conductor grounded, this rule is simple and needs no further explanation. For multiwire branch circuits of 600 volts or less, however, there are three methods of implementing this rule.

The first, and certainly the most common, method is to use a multipole circuit breaker with an internal common trip mechanism. This breaker is operated by an external single lever internally attached to two or three poles of a circuit breaker, or the external lever may be attached to multiple handles operated as one, provided the breaker is a factory-assembled unit. Underwriters Laboratories refers to these devices as multipole common trip circuit breakers. These circuit breakers are required to be used for multiwire branch circuits fed from both 3-phase and single-phase ungrounded systems. Of course, they are permitted to be used on any multiwire branch circuit within their rating.

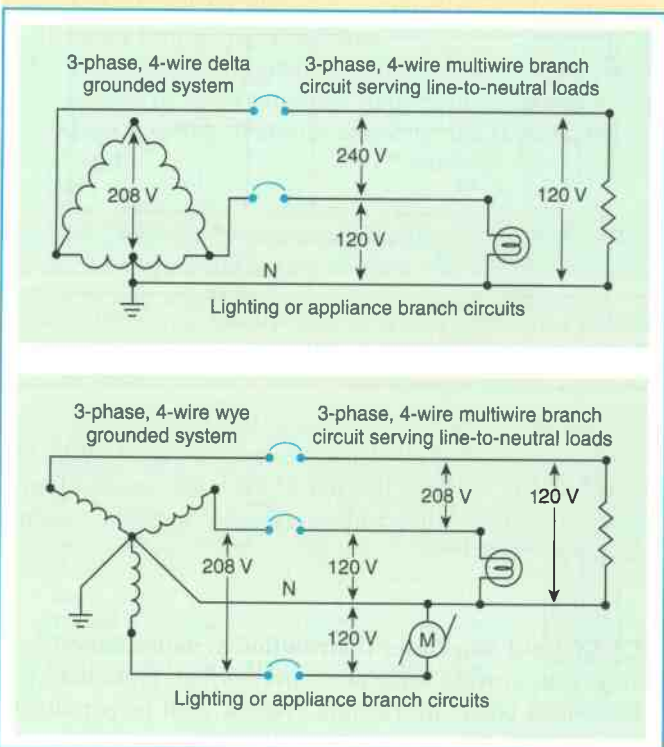
The second method is to use two or three single-pole circuit breakers and add an approved handle tie to function as a common operating handle. This multipole circuit breaker is field assembled by externally attaching an approved common lever (handle tie) onto the two or three individual circuit breakers. It is important to understand that handle ties do not cause the circuit breaker to serve as a common trip mechanism, but rather allow for common switching only. Handle tie mechanism circuit breakers are permitted as a substitute for internal common trip mechanism circuit breakers only for limited applications. Unless specifically prohibited elsewhere, circuit breakers with approved handle ties are permitted for multiwire branch circuits only if the circuit is supplied from grounded 3-phase or grounded single-phase systems. The single-pole circuit breakers used together in this fashion must be rated for the dual voltage encountered, such as 120/240 volts.

The third method is to use individual single-pole circuit breakers without common trip mechanisms or without handle ties for multiwire branch circuits. Unless limited by other sections of the *Code*, this method is permitted for multiwire circuits, provided the multiwire branch circuit supplies only single-phase line-to-neutral loads.

Exhibits 240.4, 240.5, and 240.6 illustrate some examples of how the requirements in 240.20(B) are applied. In Exhibit 240.4, where multipole circuit breakers are required, handle ties are not permitted because the circuits are supplied from ungrounded systems. In Exhibit 240.5, in which single-

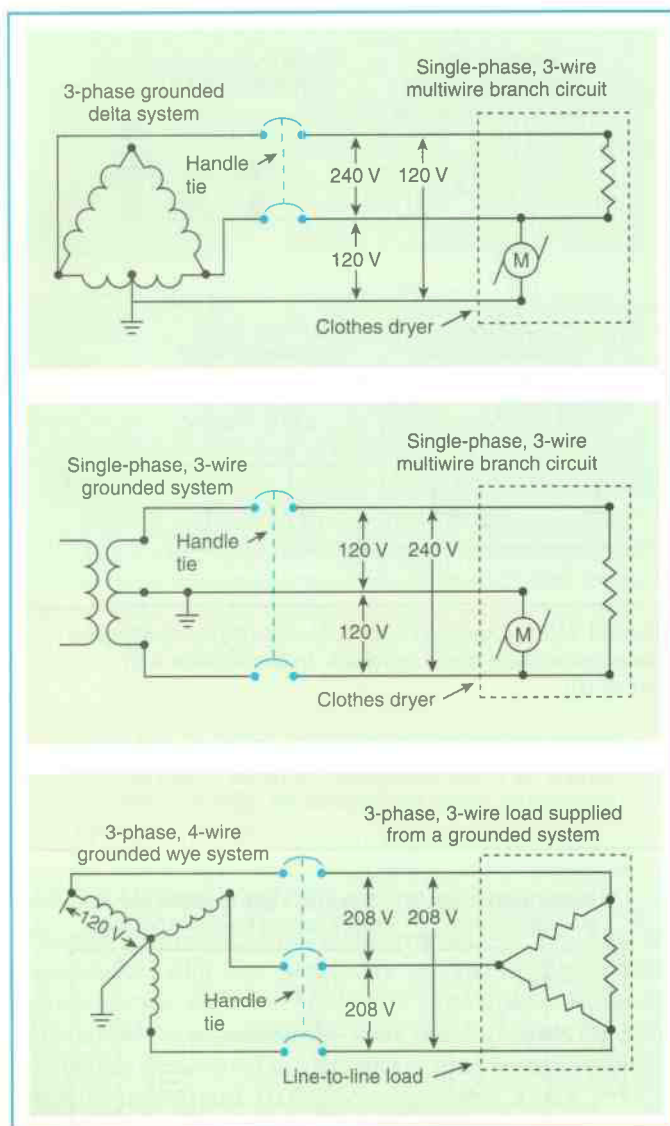


**Exhibit 240.4** Examples of circuits that require multipole common trip-type circuit breakers, in accordance with 240.20(B).



**Exhibit 240.5** Examples of circuits in which single-pole circuit breakers are permitted, in accordance with 240.20(B)(1), because they open the ungrounded conductor of the circuit.





**Exhibit 240.6** Examples of circuits in which approved handle ties are permitted according to 240.20(B)(2) or 240.20(B)(3).

pole circuit breakers are permitted, handle ties are not required because the circuits supply line-to-neutral loads. In Exhibit 240.6, in which line-to-line loads are supplied from single-phase or 4-wire, 3-phase systems, approved handle ties are permitted.

**(C) Closed-Loop Power Distribution Systems.** Listed devices that provide equivalent overcurrent protection in closed-loop power distribution systems shall be permitted as a substitute for fuses or circuit breakers.

### 240.21 Location in Circuit.

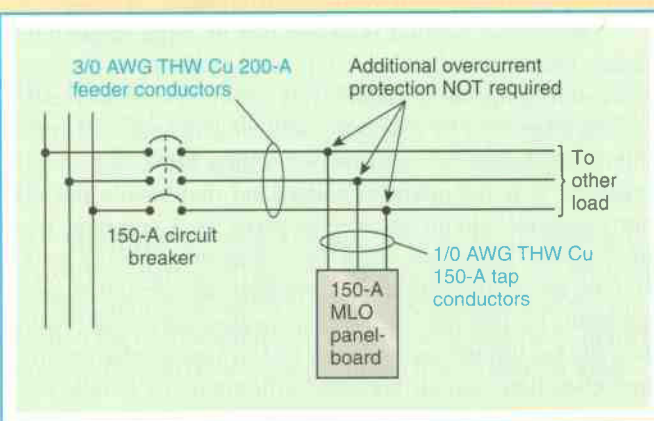
Overcurrent protection shall be provided in each ungrounded circuit conductor and shall be located at the point where

the conductors receive their supply except as specified in 240.21(A) through (G). No conductor supplied under the provisions of 240.21(A) through (G) shall supply another conductor under those provisions, except through an overcurrent protective device meeting the requirements of 240.4.

**(A) Branch-Circuit Conductors.** Branch-circuit tap conductors meeting the requirements specified in 210.19 shall be permitted to have overcurrent protection located as specified in that section.

**(B) Feeder Taps.** Conductors shall be permitted to be tapped, without overcurrent protection at the tap, to a feeder as specified in 240.21(B)(1) through (5).

Exhibit 240.7 illustrates how a smaller 1/0 AWG, Type THW copper conductor (150 amperes) is tapped from a larger 3/0 AWG, Type THW copper feeder conductor that is sized at 200 amperes to compensate for voltage drop and that is, in turn, protected by a 150-ampere circuit breaker equal to the ampacity of the 1/0 tap conductor. The circuit breaker protecting the feeder conductors also protects the tap conductors. *Additional overcurrent protection is not required.*



**Exhibit 240.7** An example in which the circuit breaker protecting the feeder conductors is permitted by 240.21(A) to protect the tap conductors to the cabinet.

**(1) Taps Not Over 3 m (10 ft) Long.** Where the length of the tap conductors does not exceed 3 m (10 ft) and the tap conductors comply with all of the following:

- (1) The ampacity of the tap conductors is
  - a. Not less than the combined computed loads on the circuits supplied by the tap conductors, and
  - b. Not less than the rating of the device supplied by the tap conductors or not less than the rating of the overcurrent-protective device at the termination of the tap conductors.

## (名古屋) 講演会「設備技術者のあるべき姿 ～海外と日本の相違～」

新しい建築士制度が昨年11月28日よりスタートし、約2700人の設備設計一級建築士が誕生しました。しかし、新制度は当協会を始め業界が望んでいた意向と実態に乖離した資格であり、いまだに、建築設備士を設備設計・工事監理の業務権限のある資格にしていくべきとの多くの意見が聞こえて来ます。そして、そのような社会的背景の中でも、設備技術者はそれぞれの立場において、粛々とその業務にあたっているのが現状です。

このたび、海外において長く設備業務に携わってこられた講師を招き、日本との相違点や、設備技術者の本来のあるべき姿について貴重なお話を頂戴しました。これを機会に、設備業務の機械、電気技術者としての原点に立ち返って活動をしたいものです。

### まとめ

成熟した社会において技術者の資格とは消費者側の利益を守るためにある。この為米国では談合、下請けいじめなどの醜い事例は聞かない。一方戦後の復興期に産業界の育成を目的に出来た日本の資格制度が長年続いてきた談合の助長、技術者のレベル向上を妨げてきたとするならば、本来の形にするべく見直しが急務。

すなわちそれぞれの分野、特にエネルギーを扱う技術者が社会の表舞台に出て、責任を果たすことができる資格制度が不可欠。

今後ともご意見、ご希望がありましたら下記中部支部までメール等お寄せください。

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